MODERN PACKAGING ENCYCLOPEDIA

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Edited and Published
By the Staff of
Modern Packaging Magazine

Editorial Preface

Appearing now as the MODERN PACKAGING ENCYCLOPEDIA, the book known through seventeen previous editions as the PACKAGING CATALOG takes on a name which more accurately describes the functions it has always performed.

Like all of the preceding volumes, this edition is larger than its predecessors, to be expected in a field as dynamic as packaging. More important than mere size is the fact that three fourths of the content represents entirely new material. While more than half of the articles bear the signatures of qualified technicians in many lines, of whose contributions we are particularly proud, it is worth remarking that there is a considerable increase in the amount of research and original writing by members of the staff. Information about many packaging methods and materials is obtained from diverse and often unrelated sources, the synthesis of which requires staff treatment.

Articles retained from previous issues represent basic information. They have been thoroughly reviewed by one or more experts in the fields concerned, to insure inclusion of new developments as well as revision of previous material.

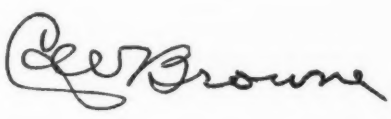
New features that are especially noteworthy include an economic-historical review of the development of packaging with particular reference to its commercial significance; a symposium in which package designers dissect their own activity; a check list for package planning that embraces structural and economic elements as well as appearance factors; a bibliography of current magazine literature pertinent to packaging; new trends in legal regulation of trade-marked goods; a new photographic review of folding box types; diagrammatic presentation of bag closing methods; three articles on the theory and practical aspects of vacuum-gas packing; recent developments in the fast-moving field of plastics; adhesives from the user's point of view; pack-

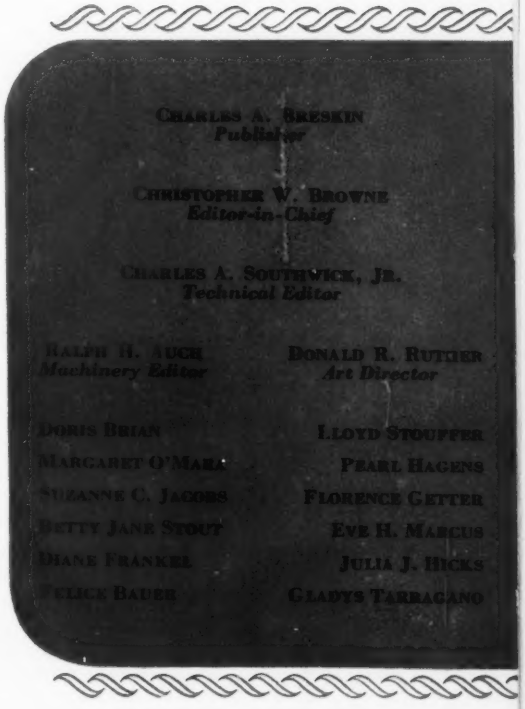
age machinery (an entirely new chapter) as the production man sees it—a complete list would be too long for mention here.

Ready accessibility of content has been given much thought. The nature of the subject precludes following the traditional encyclopedic alphabetical arrangement, but carefully prepared indexes will help the busy reader locate information quickly. A long list of charts, diagrams and tabulations, as well as an eight-page alphabetical subject index, will facilitate ready reference. Lists of manufacturers and sources of supply have likewise been subjected to most careful scrutiny to insure current accuracy.

The preparation of the book this year has been delayed by obstacles that face every industry in these difficult times. This unavoidable delay is regrettable, but it now appears that it may be permanently advantageous to make the annual publication date early in September. Despite the unusual difficulties—or perhaps because of them—the editors approached their task this year with a keener sense of responsibility than ever. Packaging, it becomes more evident, is a subject of great fluidity, involving both art and science. Because of the constant progress in the field, editorial problems of selection, relative emphasis and organization are ever present; and, because each of the many fields served has its own terminology, there is the added editorial task of employing a common terminology that provides a medium of exchanging ideas between those many and diverse fields.

It is with the hope of continuing to merit the confidence of the packaging field that the 1946–1947 edition is respectfully submitted.





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from Cracker Barrel

...The significance of



PHOTO, THE PROGRESSIVE GROCER

1886 *Food came in bulk, shoppers in bustles.*



PHOTO, SUPERMARKET MERCHANDISING

1946 *The country store is a memory.*

Once a boy sat dreaming as he watched steam bobbing the lids up and down on the boiling kettles over his mother's hearth.

The boy was James Watt. During the 18th century his dreams were realized in the invention of the steam engine that was to revolutionize the social and economic life of the world—steam power that was to run the ships, the railroads, the mills and factories—that was to lure rural populations to the industries in the cities—that was to create vast new markets for mass produced foods, drinks, drugs and toiletries.

Packaging as we know it today began with the industrial revolution that followed the introduction of steam power and later electric power.

In a sense, there was packaging before that. There were "packages" as far back as man used goat skins to carry water, made crude pottery, glass bottles and baskets in which to store and transport his worldly goods. In 1035, Khorsan, a Persian traveler, reported that Arab merchants in Cairo were using sheets of paper to wrap up their wares. A Roman package containing an ointment with the maker's name engraved on the lead cover of a pottery jar and the famous Lambeth jar of Venice Treacle, a poison antidote, with the maker's name on the jar were sold in England in 1650.

The use of these containers, however, is scarcely applicable to the modern American conception of packaging to provide billions of convenient consumer sales units that protect the product through the channels of distribution from the time it leaves the factory until it reaches the ultimate user who may be thousands of miles from the place where the product is made. Nor do the early containers indicate the use of the package as a modern sales tool for promoting factory-made, branded merchandise and the good will of the maker.

Packaging as an industrial science is scarcely a century old. It is the child of mass production and competitive enterprise that gained momentum during the second half of the 19th century, changed buying habits of the American people and raised American living standards to a place of envy throughout the world.

The country store with its cracker and flour barrels where mice played and tabby cats took naps is almost extinct. In its place throughout the nation are thousands of modern food markets, chain stores, variety stores, drugstores, hardware stores, department stores, lined with shelf after shelf of clean, fresh packaged merchandise, contents untouched by human hands. As the years go by more and more products appear in consumer packages. In the not too far distant future, most of the fresh fruits, vegetables and meats may also be lining these shelves and counters in packages as well as hundreds of textile items previously sold loose.

The growth of packaging was encouraged by three significant factors:

1. The step-by-step development of mechanical methods for producing packaging materials, containers and equipment to fill and close them apace with the increasing output of industry that had to be distributed in packages.

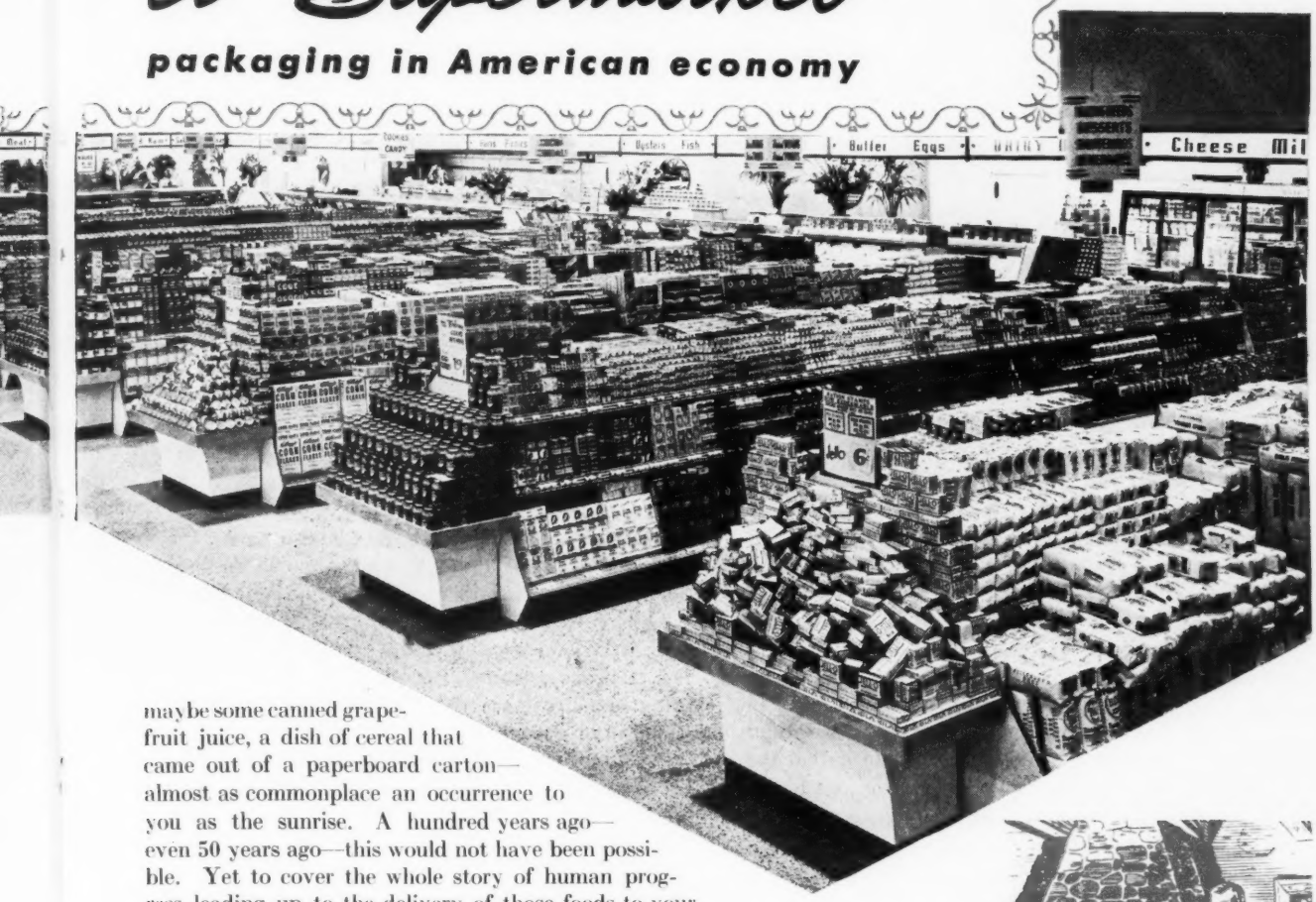
2. Consumer demand for branded merchandise in packages that assured cleanliness, convenience, quality and quantity for which the maker was responsible.

3. Vision of enterprising manufacturers to see the advantages of using a branded package to advertise their products in a competitive market.

This morning for breakfast you probably had a cup of coffee that came out of a vacuum sealed glass jar,

to Supermarket

packaging in American economy



may be some canned grapefruit juice, a dish of cereal that came out of a paperboard carton—almost as commonplace an occurrence to you as the sunrise. A hundred years ago—even 50 years ago—this would not have been possible. Yet to cover the whole story of human progress leading up to the delivery of those foods to your kitchen would take volumes and one must turn back the pages of history thousands of years.

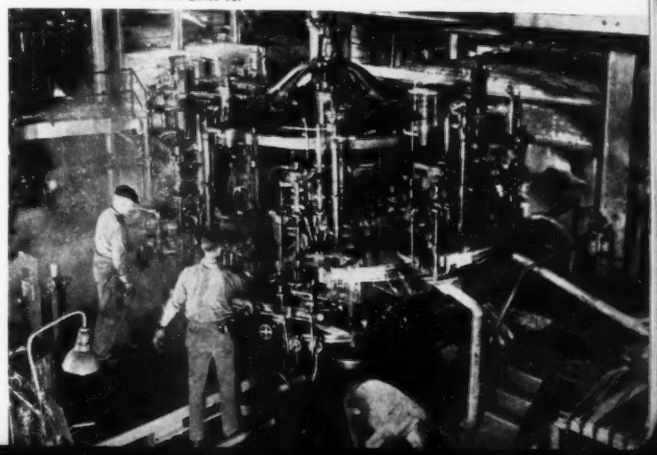
Modern glass containers, for instance, are produced by man from essentially the same materials Nature uses to fuse, by volcanic fire, the natural substance known as quartz. Quite by accident, it is believed, the ancients discovered that sand and soda ash heated to high temperatures would produce glass and there is evidence that decorative glass bottles were in use in Egypt more than 4,000 years ago, although the "blowpipe" was not discovered until the third century, B.C.

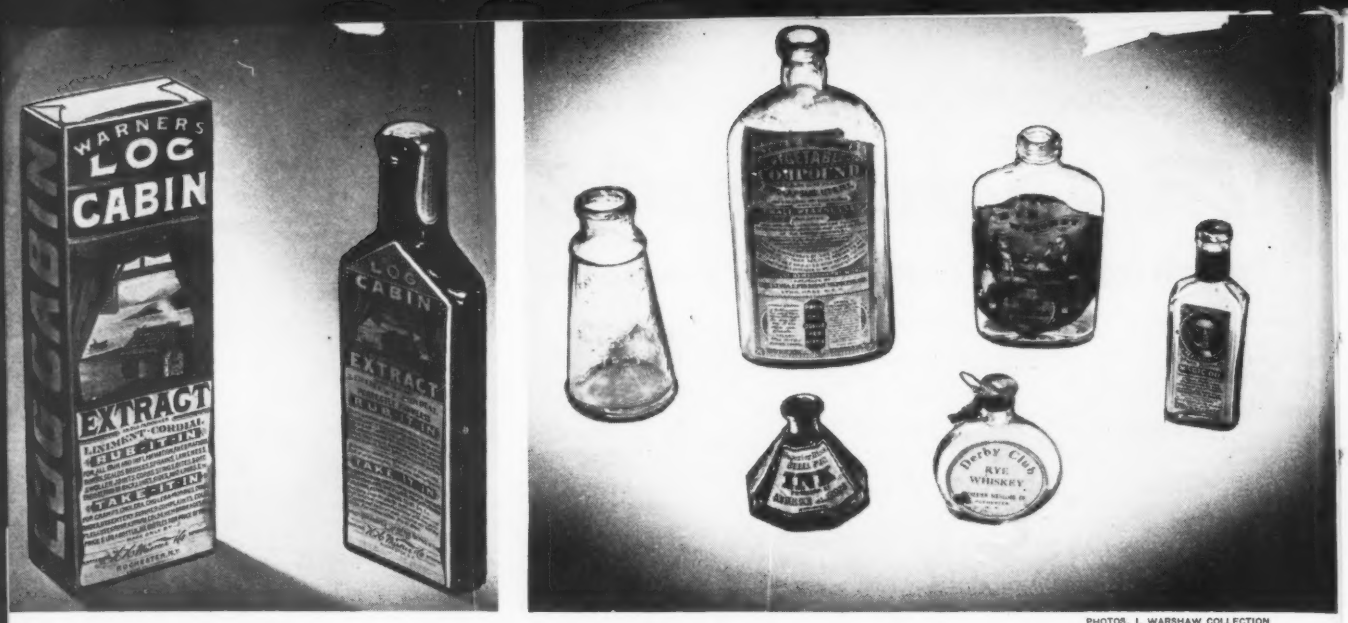
The first glass manufacture in America dates back to the first glass furnace erected about a mile from the colony of Jamestown, Va., in 1607. The next attempt was at Salem, Mass., in 1639. Many glassmakers started business during the next two centuries, including the famous Sandwich Glass Works on Cape Cod, but all of them made glass by hand until Michael J. Owens, an employee of the Libbey Glass Co., in Toledo, Ohio, now a plant of the Owens-Illinois Glass Co., patented his famous bottle-making machine in 1899. Today, one Owens rotary machine can turn out as many as 20,000 glass containers a day, making pos-



Nicholas Appert experiments with food processing, receives award from Napoleon. Below, Owens rotary glass-making machine turns out 20,000 containers a day to package drugs, foods, other essentials.

ILLUSTRATIONS, OWENS-ILLINOIS GLASS CO.





PHOTOS, I. WARSHAW COLLECTION

You would see why we have label legislation if you could read the uses for Warner's Log Cabin Extract—everything from frost bite to cholera! A stove polish bottle, an early Lydia Pinkham and other old bottles.

sible the production of millions of sturdy light-weight containers to package foods, drugs, other essentials.

The glass package, however, to be efficient had to have a closure to protect the contents. It was the air-tight closure that was to provide the means for preserving food from season to season in sealed containers. During the Napoleonic wars, so many French soldiers were dying from scurvy and starvation rather than wounds, because their diet did not sustain them, that the French government made an appeal for someone to devise a method of preserving food for long storage.

This urgency inspired Nicholas Appert, a French confectioner, to experiment with food processing. Later he was rewarded by Napoleon for his method of keeping foods for long periods in sealed containers. His method was similar to the home canning of today. He sealed cooked meats, fish, fruits and vegetables in air-tight glass containers and immersed the containers in boiling water for varying periods. He knew nothing of bacteria, but his boiling-water bath was the means for preventing the growth of bacteria that Pasteur discovered half a century later to be the agent of food spoilage.

Nicholas Appert's sealing compound was reputed to be a cement made of cheese and powdered lime, which hardened rapidly and resisted both heat and water. The porcelain-lined zinc closure for use on home preserving jars was developed late in the 19th century. The invention of Owens' high-speed glass-making machines necessitated the development of closures that could be applied at high speeds to the mass produced bottles and jars. The development of modern hermetic seals and vacuum caps thus followed the machine-made glass containers and is an innovation of our own century—a development even now being improved.

First use of metal containers for preserving foods was revealed in English patents taken out in 1810 by Peter Durand. Shortly thereafter tins of foods were sent to the British Army and Navy for trial during the Napoleonic era. It is recorded that the Duke of Wellington tried the beef preserved this way and had a message sent back home that he "found it very good."

It is believed that William Underwood started the first American canning operations in Boston in 1819, using Appert's procedure. In 1820 both Underwood in Boston and Thomas Kensett in New York were producing canned foods commercially. In 1853 Gail Borden perfected the process for the manufacture of condensed milk which saved the lives of thousands of babies.

Large-scale canning in America began, however, during the Civil War. Armies have to be fed and just as World War II demonstrated the importance of the highest type of protective packaging for K and C rations, the Civil War demonstrated the advantages of hot processed foods in metal cans.

Today cans probably carry more of the world's food supplies than any other one type of container. Foods preserved in cans may be eaten years after they are canned with the assurance that they are in as good condition as when they were processed. Nicholas Appert and other pioneers of the canning industry would stand in amazement if they were to visit a modern canning plant to see mechanically made cans rolling down assembly lines, filled and sealed at speeds of 150 a minute —sometimes as fast as 300 per minute.

The origin of paper and paperboard harkens back to the ancient Chinese and to the Egyptians, who discovered that the fibres of the papyrus plant which grew along the banks of the Nile could be compressed into a sheet of papyrus or paper. The predecessor of paperboard was "book-board" made by early printers for the covers of their handmade books. These were formed by laboriously pasting together layer on layer of scrap paper, "laminating" as it would be called today, and hence the derivation of the word pasteboard.



One of Andrew Dennison's first box-making machines—the corner cutter and scorer. The principle of this machine is still standard today in box-making factories.

ILLUSTRATIONS, DENNISON MFG. CO



Col. Dennison making set-up boxes by hand at his cobbler's bench at family homestead in Brunswick, Me. This laborious process led him to invent the machine for box-making.

The first handmade paper mill in America was established in 1690 by William Rittenhouse on Wissahickon Creek, Germantown, Pa., because publishers of the time didn't want to take the chance that political conditions might interrupt the supply from England.

The Fourdrinier machine for paper making was patented in France on January 18, 1799, by Nicholas-Louis Robert, but the original machine was taken to England by Henry and Sealy Fourdrinier, improved and patented April 20, 1801, under their name.

The first Fourdrinier machine in the United States was installed in a mill in Columbia County, New York, in 1827. At that time, however, the Fourdrinier machine was not used for making paperboard. Paperboard was being made by hand, either by pasting sheets together as the European printers had done for book-board or by pouring a heavy layer of pulp mixture onto a mold.

Several mills in New England were making such board by hand about 1800 and among other things it was used for the making of hat boxes, jewelry boxes and boxes for beads used by the ladies of the day for their handmade bead work. Some of these boxes, excellently preserved, are in existence today in the collections of the Metropolitan Museum in New York, the Atwater Kent Museum and Friends Historical Assn. in Philadelphia and others. The boxes are all handmade in the style of the set-up boxes of today, paper covered, pictorially designed—sidelines of the hatmakers and jewelers.

Paperboard was first made mechanically on a cylinder machine. First successful installation was in 1831 in the plant of George A. Shyrock near Chambersburg, Pa. The use of the Fourdrinier machine for board manufacture was not made until 1910–11, when The Hinde & Dauch Paper Co., installed such a machine in its mill at Sandusky, Ohio, for the manufacture of strawboard—a significant occasion, since it meant the subsequent employment of the Fourdrinier machine on a tremendous scale for kraft board production in the South.

What was known in its day as a "paper of tacks" is generally regarded as the grandfather of the folding carton. Appearing about 1850, because of the difficulty of handling a pile of tacks, it was formed by winding a sheet of board by hand around a wooden block or mandrel. One end was then folded in and secured with a pasted-on label. The mandrel was removed, the box filled with tacks, the other end folded in and the whole tied with string. It is believed that the "paper of tacks" closely resembled the present-day carton of carpet tacks.

One of the early makers of folding cartons was Robert Gair of Brooklyn, printer, paper merchant and manufacturer of paper and paperboard specialties. The cartons were made by scoring the blanks individually, piling up 20 or so at a time and cutting the flaps with some kind of guillotine knife. One day in 1879 while examining a seed envelope job that had gone wrong in his plant,





*Military hat box (1812) Atwater Kent Museum**

* Photo from "*Paperboard and Paperboard Boxes—a History*" by Harry J. Bettendorf, *Fibre Containers*, Sept. 1945; © author.



Lithographed metal containers of the 19th century for coffee, cocoanut and tobacco. Lunch pail container at left was put out by Edwin I. Gillies for children to carry lunches in, after coffee was used.



Collection of old boxes. Most amusing is the promotional copy on the corset box. Says the maker: "I do not advise any woman to wear a corset, but if she will do so—and she generally will—I advise her to use one of Ball's Health Preserving Corsets as it is less likely to do her injury than any with which I am acquainted."

PHOTOS, I. WARSHAW COLLECTION

Gair discovered a way to cut and crease folding box blanks automatically. The type on the printing plates for the seed envelope job had cut through the paper. This suggested to Gair the method of replacing printing plates on a press with rules and knives which would crease and cut the box blanks—the basis for folding carton manufacture today.

The principle for making corrugated board, it is said, dates back to the invention of fluting irons, similar to those used to form the kind of ruffs worn by Queen Elizabeth and her court. First patents for corrugated board were taken out in 1856 in England, but it was not until 1871 when A. L. Jones took out a patent in the United States for an unlined corrugated sheet to be used for packing glass, especially lamp chimneys, patent medicines, beverages, etc., to replace straw and excelsior that corrugated materials received much consideration. In 1874 Oliver Long obtained a patent for lined single- and double-faced corrugated board. Other names that appear among the corrugated pioneers are those of Henry D. Norris, Robert H. Thompson and Robert Gair, originator of the company which today bears his name. In the beginning, however, no containers were made of corrugated material. It was used only as a packing material. Demands for lighter weight cartons of good structural strength, however, at that time led to the development of the corrugated shipping container, made on the principle of the folding carton. It was not until 1903 that corrugated containers were accepted in official freight classifications as shipping boxes for cereals and it was 1906 before formal acceptance was given to them generally as freight containers.

The solid fibre container, which played such as important part in the weatherproof box development for World War II shipments, did not appear until about 1904. Yet its multi-ply construction of layer on layer of paperboard is remindful of the original "book-board" which the early printers made from scrap.

Handmade paperboard boxes were made in China for packages of tea in the early 18th century. Records show paperboard boxes used for pills, confections and face powders in England early in the 19th century.

First commercial development of set-up boxes in the United States, however, is credited to Aaron L. Dennison, brother of the founder of the present Dennison Mfg. Co., Framingham, Mass.

He was a jeweler in Boston and his first boxes were made with jack knife, rule, pastepot and wooden frame.

The boxes were for himself and other Boston jewelers, who had previously used boxes imported from Germany.

Aaron, however, was interested in jewelry and the idea of machine-made watches. His father, Col. Andrew Dennison, on the other hand, was looking for a new occupation to take the place of his declining cobbler's trade. It was arranged that the father take over the box-making business at the family homestead at Brunswick, Me., where Col. Dennison would make the wood forms and cut out board and cover paper on his cobbler's bench with an ordinary knife for corner cutting and scoring. Daughters Julia and Matilda set up the boxes by shaping them over the forms and covered them. In 1844, Col. Dennison wrote his son in Boston that they had made five gross of boxes a day, but complained of the slowness of cutting the boxes by hand. During the same year he developed his famous hand-operated corner cutter machine that cut one corner from one end of a box blank and one score in the blank. Principle of this machine is still standard in box factories.

Letters exchanged between the elder Dennison and his son indicate that box sales grossed about $1900 in 1846 and that prices ranged from 3 to 6 cents apiece.

E. W. Dennison, the Colonel's youngest son, entered the business about 1848, eventually took it over from his father in 1855, and was responsible for building up the box business and the famous line of tags, labels and seals for which Dennison Mfg. Co. is famous today.

Nobody knows who invented the paper bag. It is probably the descendant of the paper cornucopia. About 150 years ago it was a standard item for grocers and seedmen to package the loose products they sold—beans, sugar, flour, coffee, potatoes—at a time when these commodities were sold in bulk. The bags were laboriously hand made by retailers in the back room during their spare time from rolls of paper.

Then, in 1852, an enterprising man in Bethlehem, Pa., Francis Wolle, was granted a patent for a machine that would make bags.

About the same time other bag machine inventors appeared in Boston—Whitney and Priest. In 1869 Pioneer Wolle, his brother Augustus, S. E. Pettee, F. W. Leinbach and L. Whitney Jr., formed the Union Paper Bag Machine Co. This group which owned all bag machine

DATES TO REMEMBER IN PACKAGE HISTORY

1607 First glass furnace in America, Jamestown, Va.

1690 First paper mill in America established by William Rittenhouse at Germantown, Pa.

1801 Fourdrinier paper-making machine patented in England—although originally patented, 1799, in France by Nicholas-Louis Robert.

1809 Nicholas Appert awarded prize by French government for method of preserving food by canning.

1810 First English patents for use of metal containers to preserve foods taken out by Peter Durand.

1819 William Underwood started first commercial canning operations in America.

1819 Bass Otis introduced lithography in United States.

1827 First Fourdrinier machine installed in America in Columbia County, N. Y.

1831 First cylinder machine for making paperboard installed at Chambersburg, Pa.

1841 Collapsible tube patents granted to John Rand—tubes used for Devoe & Raynolds artists' paints.

1844 Col. Andrew Dennison made first set-up box-making machine.

1850 Appearance of "paper of tacks"—the "grandfather" of the folding carton.

1852 Francis Wolle, Bethlehem, Pa., granted patent for bag-making machine.

1856 First patents for corrugated packing material taken out in England.

1858 Earliest record of foil manufacture in America—Richard Cooks using German and Italian patents.

1869 John Wesley Hyatt made first plastic later known as Celluloid.

1870 (Circa) Herman Wirz brought plans from Europe for machine production of collapsible tubes in United States.

1871 A. L. Jones patents for making corrugated board in America.

1874 Oliver Long patents granted for making lined single- and double-faced corrugated board.

1879 Robert Gair discovered mechanical method for cutting folding carton blanks.

1886 (Circa) Quaker Oats appeared in handmade square cartons.

1899 Rotary glass-making machine patented by Michael J. Owens.

1899 End of Cracker Barrel Era—National Biscuit Co. put Uneeda Biscuits in consumer unit packages.

1904 First appearance of solid-fibre container.

1906 Formal acceptance of corrugated containers for freight shipments.

1908 Dr. L. H. Baekeland developed Bakelite (phenol-formaldehyde plastic).

1910 Fourdrinier machine installed by The Hinde & Dauch Paper Co., Sandusky, Ohio, for board manufacture.

1924 Du Pont erected cellophane plant at Buffalo, N. Y.

1925 (Circa) Molded phenolic used for collapsible tube caps.

1927 Reynolds Metals Co. launched large-scale program of aluminum foil manufacture.

1930 Cellulose acetate film and sheet made for packaging purposes.



Gunpowder cans that probably went west in covered wagons. Round boxes were for shoe polish; square, for cake tobacco.

PHOTOS, I. WARSHAW COLLECTION



Appetite appeal is not new as picture of tomato on catsup bottle indicates. Nestle's baby food is old timer.

patents and leased machines on a fee basis controlled 90% of the paper bag business in the United States. Today the Union Bag & Paper Corp., lineal descendant of that combination turns out 25,000,000 paper bags a day in one plant in Savannah, Ga. And paper bags may be made moisture resistant, greaseproof, to hold a hundred pounds of hot chemicals and protect their contents from immersion in salt water.

The making of metal foil dates to antiquity. It is believed the Chinese made foil by pouring metal into thin slabs; then, by hand pounding, changed the slab into a leaf or thin sheet. At any rate many early tea packages were wrapped in foil. Some of the earliest patents for rolling machines to make tin and lead foils were those of the Germans and Italians. Among the earliest American records is that of Richard Cooks, who started with a small foil manufacturing business in 1858 using foreign patents upon which he made improvements.

One of the big names in the manufacture of foil for packaging, of course, is that of R. S. Reynolds, who during the second decade of our century became interested in rolling foil for his uncle's cigarette business.

Among the first to introduce the rolling of aluminum foil in this country was a Dr. Lauber, a German, through the Connelly Foil Co. of New York. Later this company, with other foil manufacturers, was absorbed by the Reynolds Metals Co., which by 1927 had about six foil mills in operation.



This little boy is probably one of country's best known trade characters. His famous Uneeda Biscuit package has just been changed to meet the modern demand for pictorialization of contents on wrap.

(Page 26)



First Quaker Oats packages were filled and sealed by hand. Old lithograph reproduced here shows women pasting labels. Machine packaging introduced about 1895.



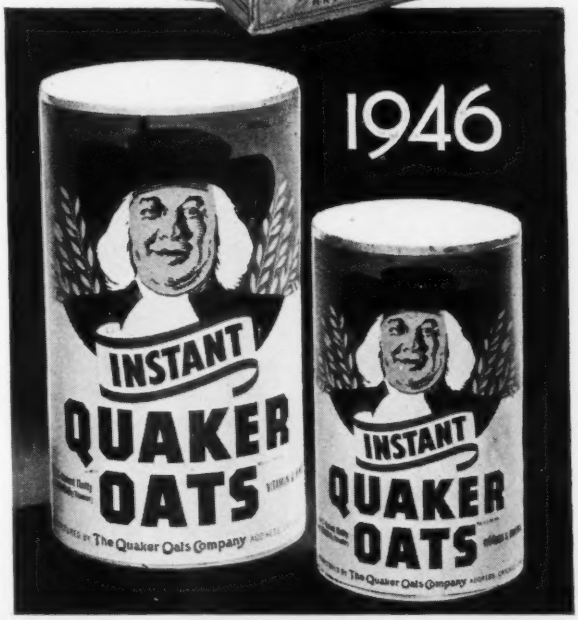
1886

First American patents for collapsible tubes were issued to John Rand in 1841. The tubes were used by Devoe & Raynolds Co. for "colors in oil" or artists' paints. Machine production of tubes, however, developed in France and Germany. Plans for the first equipment to make tubes mechanically were brought to this country in the '70s by Herman Wirz, one of the founders of the present A. H. Wirz, Inc., of Chester, Pa. One of the early products in these machine-made tubes was a beauty aid known as cucumber jelly. Among the early products that had a great deal to do with the widespread use of collapsible tubes was Colgate's toothpaste, still one of the leading users.

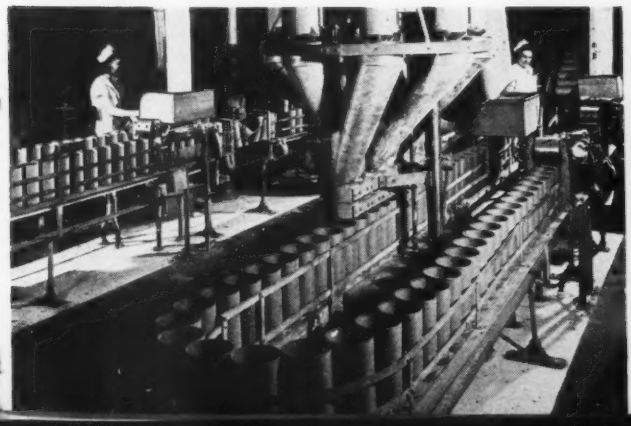
The first transparent film for wrapping packages came to this country from Europe in the early '20s. It was called "fenestra" paper and considered so valuable it was locked up in safes at night. Little was it realized then what an impact this new "see-through" material was to have on packaging.

The real story of transparent packaging in America begins in Buffalo, N. Y., when Du Pont erected and put into operation in 1924 the first plant designed to manufacture cellophane that had formerly been imported from France. Sylvania Industrial Corp. began making cellophane in 1929, using a Belgian process.

This was the beginning of a whole new conception of



New Quaker Oats packages adopted this year are shown at right. Automatic machine production is now used every step of the way in the packaging. Weighing machines fill and discharge tube containers. Labeling unit (right).





XUM

packaging. During the depression years, visibility packaging gave a new merchandising "shot in the arm" to sluggish business.

Cellophane was followed by other transparent films: cellulose acetate films and sheets in 1930 and at about the same time the development of ethyl cellulose sheet and film, the vinyl-type films and Pliofilm. Every manufacturer who could possibly put his product into a transparent package demanded the visible container or wrap. Everything from bread to grand pianos was wrapped in transparent packaging. The war put a stop to it, when these materials went to the fighting fronts, but the zest for transparent packaging is back—all the way from the demand for nearly a hundred varieties of cellophane to the rigid drawn containers made from transparent plastic sheets and the elaborate molded and fabricated containers from acrylics.

"Celluloid" (cellulose nitrate) made for billiard balls by John Wesley Hyatt in 1869 is usually considered the first plastic material.

Only during the last 20 years, however, has the use of plastic materials in packaging assumed a role of importance, particularly in the wide use of resinous compounds for coatings and laminations that give protective and decorative qualities to other materials, for the films and sheets mentioned in a previous paragraph and for the millions of plastic closures used on glass containers as well as for many types of molded containers used in the cosmetic, drug and other fields of packaging.

The year 1899, when the National Biscuit Co. took crackers out of barrels and put Uneeda Biscuits into paperboard cartons treated to resist moisture and folded around a waxed paper liner, is usually regarded as the outstanding date marking the transition from the inefficiency of bulk merchandising to that of modern consumer unit packaging. The pre-Uneeda Biscuit era is thus known as the "cracker barrel days."

Actually there was a considerable amount of unit-packaging in the the cereal field before that date. The recent redesign of Quaker Oats packages (MODERN PACKAGING, March, 1946, p. 126) reveals that Quaker Oats were in square consumer-unit cartons sometime prior to 1886, one of the first packaged cereals.

It was H. P. Crowell, associated with the American Cereal Co., a predecessor of the Quaker Oats Co., who grasped the merchandising opportunities for advertising Quaker Oats to the housewife. Such advertising presupposed in place of the community barrel, the use of small packages on which the maker could print his brand.

Grocers who purchased oatmeal in bulk from the lowest bidders resisted these first attempts at brand promotion, but consumers liked it, and preferred the cleanliness and convenience of the package.

At first these packages, now turned out by the millions on completely automatic production lines, had to be glued, filled, weighed and labeled by hand. The only



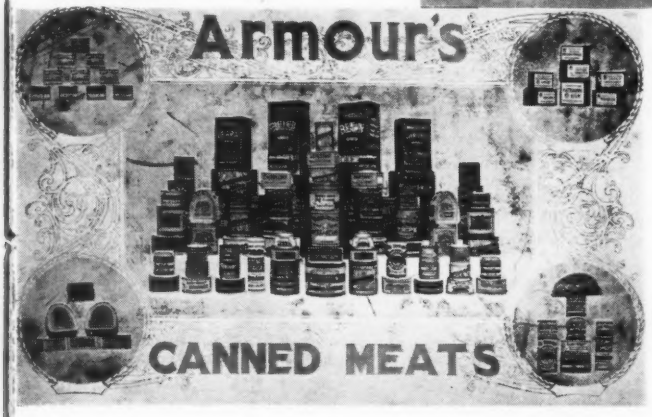


Two photos from the files of the Automatic Scale Co. show filling lines at the turn of the century. The "Gibson" girls are filling cans of spices. Similar equipment is shown (right) for filling bags of Edwin J. Gillies coffee.

(Page 28)



The trend to simplicity in package design for today's food markets is no better illustrated than by this contrast between the early group of Armour packages below and the newly redesigned modern Armour packages at right.



machine operation was the cutting of the blank. The first machine which weighed portions and filled about 20 packages of Quaker Oats per minute appeared about 1895, according to "A History of the Quaker Oats Co." At the turn of the century the Quaker Oats Co. was buying many weighing machines from the Automatic Weighing Machine Co., one of the ancestors of the present Automatic Scale Co., probably filling at speeds of about 30 per minute.

An interesting comment comes from William J. Beck of the present Automatic Scale Co. who mentions an Automatic Weighing and Package Filling Machine Co. which was quoting weighing machinery in 1886.

"The outfit was operated," says Mr. Beck, "if memory serves us right, by two brothers Weyant, one of whom was a locomotive fireman and the other a Methodist clergyman."

J. L. Ferguson, founder of the machine company which now bears his name, was once an employee of the Quaker Oats Co. He developed a sealing machine in 1911 which sealed both ends of the packages in one operation. The Quaker Oats Co. did not adopt its now familiar round package until 1915.

Cereals, because of their light weight and the ease with which they could be mass produced, had a significant influence on the development of national distribution of packaged foods. Some of the cereal manufacturers were also among the first to adopt a printed carton as distinguished from unprinted cartons covered with a printed wrapper still used for Uneeda Biscuits.

Another development attributed to the cereal package is the tight-wrapping machine, the first semiautomatic machine introduced by Stokes & Smith in 1917.

Basic materials for packaging come from all parts of the world and form an essential part of international trade. The mouthwash, for example, that you get at the corner drugstore is in a bottle. The sand for glass may have come from Ohio; latex for the coating on the closure liner from Malaya; lacquer for the closure enamel from India; chalk for the clay-coated board used to make the carton that protects the bottle, from the White Cliffs of Dover.

Indefinitely one could cite examples to trace the improvement in ways of making packages, filling and sealing them. More volumes could be written on the development of printing methods relating to their use in packaging from the time William Bradford brought the first printing press to America and Bass Otis introduced lithography in the United States in 1819. Volumes could be written on the scientific research and technological development of protective packaging materials —on design to give greater eye appeal—to make packages more convenient.

And behind every line that was written would be the picture of a changing America where the science of packaging has become the inseparable aid to mass production that brings better living to America's millions.

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XUM

Statistics of packaging

by Morris Moses

The end of the war has not brought an end to the raw material shortages. Steel continues in short supply. Government controls of the tin supply are expected to continue through 1946 because the time required to install equipment in recovered tin producing areas will probably preclude large shipments before 1947.

Discharge of manpower by the military has not yet relieved a very acute shortage of most forest products. Rising imports of pulp are augmenting the supply of paper and paperboard. The heavy demand for gypsum liners menaces the supply of paperboard available for containers.

Added facilities probably will not make material contributions of paperboard before 1947. Although the tonnage of containerboard may not increase in 1946, more square feet should be available since virtually no V-board will be produced. Lumber stocks and production in 1945 are approximately 15 per cent below 1944 and, unless manpower relief is forthcoming, the heavy demands for construction may lead to a tighter supply in 1946. Limited world resources have compelled the Civilian Production Administration to retain controls on lead and no significant relief is on the horizon.

The demand for consumer-type containers will probably persist at the same or higher levels than during

TABLE I—ESTIMATED PRODUCTION OF CONTAINERS, *1940–45*[1]
[Index: 1940 = 100]

Type of container	*1940*	*1941*		*1942*		*1943*		*1944*		*Estimated 1945*	
	Quan.	*Quan.*	*Index*	*Quan.*	*Index*	*Quan.*	*Index*	*Quan.*	*Index*	*Quan.*	*Index*
CONSUMER TYPE CONTAINERS:											
METAL CANS (THOUS. TONS OF STEEL)[2]	2,180	2,845	131	2,043	94	1,686	77	2,074	95	2,500	115
METAL CROWNS (THOUS. GROSS)	143,929	217,993	151	180,373	125	217,032	151	242,168	168	253,000	176
METAL CLOSURES (MILLION UNITS)	5,677	7,529	133	9,193	162	7,898	139	8,311	146	9,900	174
GLASS CONTAINERS (THOUS. GROSS)	52,116	68,973	132	78,615	151	92,707	178	99,727	191	103,000	198
HOME CANNING SEALS (THOUS. GROSS)[3]	10,000	14,947	149	22,002	220	31,898	319	21,024	210	8,681	87
COLLAPSIBLE TUBES (THOUS. GROSS)	3,755	3,965	106	3,690	98	5,050	134	6,584	175	6,650	177
MILK BOTTLES (TONS)	n.a.	n.a.		n.a.		n.a.		66,596		66,000	
HOOD & LID COVER STOCK (TONS)	n.a.	n.a.		n.a.		n.a.		18,155		18,000	
LIQUIDTIGHT CYLINDER CANS (TONS)	n.a.	n.a.		n.a.		n.a.		42,721		45,000	
CUPS & NESTED FOOD CONTAINERS (TONS)	n.a.	n.a.		n.a.		n.a.		84,437		74,000	
BULK ICE CREAM, FROZEN FOOD, BUTTER CARTONS (TONS)	n.a.	n.a.		n.a.		n.a.		124,677		125,000	
MILK BOTTLE PLUG CAPS (TONS)	n.a.	n.a.		n.a.		n.a.		25,904		29,000	
FOLDING BOXES (THOUS. TONS)	1,398	1,732	124	1,536	110	1,662	119	1,730	124	1,850	132
SET-UP BOXES (THOUS. TONS)	613	731	119	997	163	829	135	750	122	740	121
FIBRE CANS & TUBES (THOUS. TONS)	n.a.	n.a.		165	100[4]	307	186[4]	360	218[4]	360	218[4]
GROCERY & VARIETY BAGS (THOUS. TONS)	606	700	116	661	109	518	85	375	62	360	59
SHIPPING CONTAINERS:											
STEEL DRUMS (THOUS. TONS OF STEEL)	572	835	146	965	169	1,148	201	863	151	840	147
FLUID MILK CONTAINERS (TONS OF STEEL)	14,586	22,165	152	27,528	189	21,107	145	24,739	170	25,750	177
GAS CYLINDERS (THOUS. TONS OF STEEL)	n.a.	n.a.		175	100[4]	260	149[4]	243	139[4]	220	126[4]
BASKETS & HAMPERS (MIL. SQ. FT. VENEER)	1,529	1,498	98	1,442	94	1,227	80	1,000	65	950	62
NAILED WOODEN BOXES (MIL. BD. FT.)	4,295	5,500	128	8,840	206	11,838	276	11,500	268	10,500	244
PLYWOOD BOXES & DRUMS (MIL. SQ. FT.)	n.a.	525	100[5]	600	114[5]	700	133[5]	700	133[5]	600	114[5]
WIREBOUND BOXES (MIL. BD. FT. VENEER)	150	158	105	192	128	165	110	178	119	180	120
(MIL. BD. FT. LUMBER)	220	232	105	282	128	242	110	262	119	265	120
SLACK COOPERAGE (THOUS. UNITS)	35,000	37,829	108	47,300	135	34,110	97	30,502	87	28,650	82
TIGHT COOPERAGE (THOUS. UNITS)	7,000	7,656	109	9,000	129	5,900	84	6,236	89	5,950	85
METAL STRAPPING (THOUS. TONS OF STEEL)	100	180	180	200	200	265	265	315	315	400	400
CORRUGATED & FIBRE CASES (THOUS. TONS)	3,114	4,279	137	3,586	115	4,100	132	4,173	134	4,150	133
FIBRE DRUMS (TONS)	10,000	10,000	100	22,000	220	56,600	566	63,600	636	60,000	600

n.a.—Not available.

[1] Where the unit is expressed by weight or footage, the data show the total quantity of the principal raw material consumed in manufacture with no deduction for waste factors.

[2] Excludes wire.

[3] For the year ending September 30.

[4] Index: 1942 = 100.

[5] Index: 1941 = 100.

Sources: Department of Commerce estimates based on data supplied by other Government Agencies, trade associations, trade journals and industry representatives.

the war. The estimated high consumer buying power in 1946 presages enormous market pressure on almost all of these containers. The food pack is expected to maintain the record levels achieved during the war so that metal can sales, despite the limitations on effective demand imposed by M-81, will depend upon the supply of tin and steel.

The glass industry will increase its productive capacity by adding new facilities, yet expects demand to exceed supply. This optimism is attributable to two factors: the current oversold condition of the industry and the pressure of new products and products new to glass which will compensate for any products returning to metal. Crowns and closures should fare much as the glass industry with the exception of home canning closures and seals which, aside from zinc lids, face a glutted market.

The demand for paper and paperboard containers promises to exceed any augmented supply. Those fibre cans which have played a substitute role may encounter a softening market as previously scarce materials are made available. The loss of the dominant wartime customer, the military, has dealt a severe blow to the market for steel drums and pails, metal strapping, gas cylinders and nailed wooden boxes. Should the petroleum industry generally adopt the 18-gauge, 55-gal. drum for single trips, the loss of the 16-gauge drum business may not prove too serious.

Fibre drum demand, despite the loss of military orders, continues strong. If labor and materials are available, the production level of the last two years may well be maintained in 1946. Metal strapping, which made substantial wartime gains, depends for its future upon extensive developmental work to exploit the success achieved by the armed services in handling enormous volumes of goods expeditiously. Gas cylinders should find a poor market except for propane gas cylinders which are in very short supply.

The demand for industrial nailed wooden boxes is usually determined by the level of general business activity. The postwar level of exports will play a major role since a great majority of exported products are shipped in these containers. The resumption and steady increase of whisky manufacture have created so serious a scarcity of whisky barrels that distillers are purchasing cooperage plants to assure themselves a source of supply.

The outlook for other tight cooperage is not hopeful should steel sheet become available. Large scale construction activity with its consequent need for metallic products, added to the backlog of orders built up by products low-rated in wartime, should provide a firm market for slack cooperage. The increasing popularity of the wirebound box promises that production rather than demand will set the limit on sales; manufacturers are carrying a heavy backlog of unfilled orders. Agricultural veneer package makers have little hope of meeting demand; the acute shortage of labor finds them with a shortage of veneer logs in inventory and prospects for higher production in 1946 are poor.

TABLE II—MATERIAL CONTROL AND SUPPLY

Material	*Control orders*		*Supply situation*	
	In force Jan., 1945	*In force June, 1946*	*Jan., 1945*	*June, 1946*
ACRYLICS	M-300	None	Fair	Fair
ADHESIVES	M-333	M-333	Good	Fair
ALUMINUM	CMP	None	Fair	Fair
BARRELS				
SLACK COOPERAGE	L-232	None	Short	Fair
TIGHT COOPERAGE	L-232	None	Fair	Tight
WOODEN BEER	None	None	Short	Tight
BAGS—TEXTILE	M-221	M-221	Highly critical	Tight
BAGS—GROCERY AND VARIETY	L-261	None	Highly critical	Tight
BASKETS, HAMPERS, CRATES	L-232	None	Poor	Tight
BOXBOARD	M-378	None	Critical	Tight
CONTAINER BOARD	M-290	None	Highly critical	Tight
BOXES—FOLDING AND SET-UP	M-378; L-239	None	Critical	Tight
BOXES—WOOD	L-232	None	Critical	Tight
CANS—METAL	M-81	M-81	Fair	Fair
CASEIN	M-307	None	Fair	Tight
CELLOPHANE	L-20	None	Fair	Tight
CELLULOSE ACETATE	M-300	None	Fair	Tight
CLOSURES	L-103-b	M-43 (Tin)	Plentiful	Fair
COATINGS—PROTECTIVE	M-382	None	Adequate	Fair
CONTAINERS—CORRUGATED AND SOLID FIBRE	L-317; D-146; M-290	None	Critical	Tight
CONTAINERS—GLASS	L-103; L-103-b	L-103	Good	Tight
CONTAINERS—SPECIALTY FLEXIBLE	L-305	None	Fair	Tight
COPPER	M-9-c; CMP	None	Critical	Tight
CORK	M-8-a	None	Fair	Fair
DRUMS—FIBRE	L-337	None	Fair	Fair
DRUMS—STEEL	L-197; CMP	None	Critical	Tight
ETHYL CELLULOSE	M-300	None	Fair	Tight
GLUES—ANIMAL	M-300	None	Poor	Tight
LEAD	M-38	M-38	Critical	Critical
MACHINERY	CMP	CPA control	Critical	Tight
PAPER	Various	None	Highly critical	Tight
PAPER—GLASSINE	M-286	None	Critical	Tight
PAPER—WAXED	M-351	None	Fair to poor	Tight
PAPER—WVT BARRIER	M-380	None	Critical	Tight
PHENOLICS	M-246	None	Critical	Tight
POLYSTYRENE	M-300	None	Tight	Tight
RUBBER—NATURAL	R-1	R-1	Highly critical	Critical
RUBBER—SYNTHETIC	R-1	R-1	Plentiful	Tight
SACKS—PAPER, SHIPPING	L-279	None	Critical	Tight
STEEL	M-81; CMP	M-81	Tight	Tight
TIN	M-43; M-81; M-115	M-43	Highly critical	Fair
TUBES—COLLAPSIBLE	M-115	M-38 (Lead) M-43 (Tin)	Critical	Critical
UREA	M-300	None	Fair	Critical
VINYLS	M-300	None	Fair	Critical
ZINC	M-11-a; M-11-b; M-11-L	None	Plentiful	Fair

XUM

The functions of packaging

Most people take the benefits of packaging for granted. When war shortages forced manufacturers to use substitute materials, the general public began to realize the functions performed by this important activity. Even now, however, there are misconceptions. Many people regard packaging merely as a matter of external glamor. Some even think of it as a means of deception and concealment of the true value of the product. A few short-sighted manufacturers utilize their packages to create a false impression, or place on a good package the responsibility of making up for the deficiencies of a mediocre or inferior product. Fortunately, they constitute a very small minority.

Packaging, however, has come of age. During the past few years a new ideal has emerged, clearly defined and well balanced, of packaging's real functions. This came about partly because of the hitherto unheard of jobs packaging had to do during wartime, and partly because of the new materials that came into use due to the shortage of accustomed substances like tin and rubber, as well as limitations upon the uses of glass and paper. A scientific and analytical approach to packaging problems is now the order of the day, with the current emphasis primarily on protection.

The reason for this new concept is, of course, the clearer understanding of the hazards which packages must face on their journey from producer to ultimate consumer. Frequently-encountered hazards are: long periods of storage; rough handling by carriers and in wholesale and retail distribution channels; temperatures ranging from the tropics to the frigid zones; sudden or wide changes of temperature even in local distribution areas; wide variations in humidity as well as moisture variations in storage; action of light, bacteria, mold, dust and corrosion, as well as insect infestation and attacks by rodents. Few packages, probably, would encounter all of these hazards, but the packager must study his distribution channels, determine which of the foregoing his particular products will face, and prepare the goods accordingly.

In addition to these external conditions, the product itself may have characteristics which require special consideration, such as:

1. Humidity equilibrium
2. Quantity of deteriorating element or elements, by percentage or weight, which would make the product unusable or unsalable
3. Amount of free water
4. Per cent of oil or grease, kind and melting point
5. Chemical activity, such as alkalinity or acidity, of its ingredients
6. Per cent of volatile ingredients by weight and kind

The chemical effect of these factors on the interior of the container must also be studied, as well as such mechanical factors as the bulk density of the product, its abrasiveness and its mesh analysis. These latter factors will have a bearing on the mechanical strength, durability and tightness of the package and its material.

Therefore, in selecting package material, it is necessary to determine its properties in respect to their fitness for a particular product. These may be any or all of the following:

Tensile strength	Resistance to acids and alkalis
Percentage of elongation	Resistance to greases and oils
Bursting strength	Resistance to the organic solvents
Tearing strength	Reaction to temperature
Folding endurance	Reaction to sunlight
Water absorption	Flammability
Water-vapor permeability rate	
Permeability by gases	

For fuller information about these factors, see *Testing Package Materials and Packages*, p. 42 and chart, *Properties of Flexible Packaging Materials*, opposite p. 630.

As will be readily concluded from the foregoing, fitting the package to the product is becoming increasingly important for the proper preservation of the small consumer units which require a high degree of protection. Sometimes these packages must protect a product which is used only a bit at a time. Sometimes the package must fulfill a re-use requirement. Always in foods and drugs it must be nontoxic.

But there are other functions of packaging, less technical, perhaps, that must be considered in package convenience throughout its existence. Before the product is packed, it must be possible to handle and store the packaging material conveniently. Due consideration must be given to the requirements of mass production. Speed is here to stay, and must be accepted among the requisites of successful peacetime industry. Awkward types of package that tend to slow up manufacture have no place in tomorrow's plants. In so far as possible, shipment and storage should be facilitated by package design. Also, wholesaler and retailer have a right to expect goods which may be easily handled and efficiently stacked.

Then there is the consumer's point of view to be studied. If the package is to be handled and carried by a woman, it should be designed for ready grasping, and should be no heavier than is necessary. Packages which are destined for refrigerators, kitchen shelves, and bathroom cabinets should be built to fit. Containers for household commodities require closures tight enough to be leakproof, but these should yield to feminine hands for removal. Even frankly decorative

packages must conform to convenience requirements.

Other practical factors which may appeal to the user are such things as pouring spouts, dispensers and recipes. Transparent windows may serve several purposes, showing at a glance what the product is made of, how much of it is left, and in what condition.

If packaging had not satisfied a demand for ultimate economy, it never would have developed to its present extent. Unless in some way a package pays for itself, it dies a natural death. This does not mean that the initial cost of a package must be low in order to be economical. On the contrary, a cheap package which fails in its function of protection may be the cause of disastrous waste—may even doom the product. In other cases, if protection requirements are low, there is no advantage in expensive overpackaging.

In working toward true economy, evaluation of other package functions must be carefully established. If the package is to be depended upon for salesmanship, it is necessary to have a thorough understanding of the consumer market. In some luxury lines, apparent extravagance in the package may bring high returns. The consumer who indulges in luxuries is usually willing to pay for a fancy container. Psychologically, at least, the aesthetic touch enhances the value of the product.

In the food field, however, and with a number of household commodities, the situation is apt to be quite the reverse. Very slight differences in cost tend to attract or dissuade the purchaser. Even a fraction of a cent may cause him to seek a substitute—or a competitor's product. The food producer may well be wary of expensive packaging.

If the indicated increasing popularity of self-service eventuates, the producer who is attempting to curtail package costs may find himself in difficulties. Self-service will mean that even the humblest package will have to take on the duty of salesmanship. Just how the producer and designer will cope with the problem remains to be seen. It is quite conceivable that revolutionary changes may take place in the packaging of everyday foods and commodities as well as in many other lines.

The packaging of butter and cheese are other examples of obvious economy. The actual cost of small-unit packing for these products is probably less than the cost entailed in bulk handling. Certainly the small-unit packing is less wasteful in that it eliminates loss and spoilage. The consumer is better satisfied with uniformity in weight and improvement in sanitation.

Whether or not packaged products in the food field are actually more economical because they are packaged, consumers appear ready to accept and pay for them.

The term "appearance" as applied to a packaging function is used in a broad sense. It indicates:

1. Any attributes of the package which tend to identify the product and the producer
2. Any attributes of the package which give information concerning the product or its use
3. Any qualities or attributes of the package which invite the consumer to buy

The function of appearance is inextricably bound up with the three other package functions previously discussed. The designer must have an awareness of the contributions made by all departments concerned. He must be familiar with the product outlets, ultimate consumer requirements and the sales and marketing problems. It is his job to take up where the technician left off, accepting the results of the technician's research.

With the above limitations, the successful designer somehow contrives to characterize the product, attract the consumer's favorable attention, and supply a memory value which facilitates re-ordering. The great strides which have been made in the development of materials and in methods of reproduction give the designer a wide variety of mediums through which to achieve his ends. Moreover, increasing competition, which the return to peacetime industry is expected to bring forth, will serve to stimulate his ingenuity. (See *Using Package Surface*, p. 79 and *A Check List for Package Planning*, p. 88.)

From the foregoing discussion of the functions of packaging, it will be seen that they may be reduced to four basic principles—protection, convenience, economy and appeal, all of which are important. Perhaps for a particular product one may carry greater weight than the others; but for any product, each one is a factor that must be considered.

It will also be seen that package planning is of direct concern to every department of a business. A successful package represents a compromise among varying interests and points of view; sometimes these conflicting viewpoints must be reconciled by the top executive. Packaging can no longer be relegated to a secondary place, in the charge of someone conversant perhaps with the detailed requirements of only one of the basic functions. A good package is not the result of a flash of genius, but the product of analysis and compromise, and many departments contribute valuable and important points. The research department must explain what the characteristics of the product are and what protective qualities the package must have; it must assist in making tests of materials that provide those qualities. The purchasing department, concerned with economy and procurement, must furnish information about materials and their availability, and ensure their proper fabrication and delivery. The production department must make clear which kinds of packages will lend themselves to economical and efficient production. The legal department must be consulted to make sure that the package, and particularly its labeling, will meet the requirements of the Food & Drug Administration. The sales and advertising departments have final authority in matters of package size, copy contents, colors, market considerations and consumer acceptance. Efficient package planning calls for harmonious teamwork of executives, not haphazard, makeshift activity of subordinates.

XUM

The place of marketing research

by Archibald S. Bennett

Every time a manufacturer attempts to study and apply the results of some marketing study which has been made for another industry or competitor, or for an advertising medium or an advertising agency, he finds that it does not fit his needs—it is not custom made. Possibly this accounts for some of the suspicion of or lack of confidence in marketing research. It might be a revelation to a packaging company to employ a capable marketing research organization to make a study for it and for its own purposes only. Marketing research, properly conducted, will provide a manufacturer with a great deal more information than just a few facts about his own packages. When one is exploring the framework of thinking of the ultimate consumer, it is perfectly legitimate to explore his thoughts on a number of packages. One can find out what the customer thinks of competitive packaging as well as his own. Marketing research can discover what the retailer thinks of packages, how they meet his requirements, and he also will discuss not only the packages of the subject company, but of the competition as well, either in the same line or any other line.

Placements

Marketing research studies can be made on a new package or an old package before it is too late. It is not necessary to let years go by before finding out that a mistake has been made. There has been developed a technique sometimes called *placements*, which means that a dozen or a few hundred or a thousand packages and products can be placed in the hands of a typical representative sample of possible consumers. These consumers can be asked for their reactions to the packages, either immediately or after a period of actual usage. Placement studies are extremely helpful. Many concerns are using them now and others might find them to their advantage.

1—The researcher must ask questions so that the housewife will talk about the package, not the product.

PHOTO, COURTESY SAT. EVE. POST



The idea of placements is not new. It means simply the act of getting someone whose judgment is important to pass on the merits of a finished product, drawing, label, package, appliance or gadget, by either examining it, testing it or using it for a sufficient length of time to enable him to pass judgment on it.

When an artist has finished a sketch for use in the advertising or selling of a product or in making a package, he undoubtedly inquires of a number of his friends, and the larger number the better, as to what they think of it. When a designer finishes a design, he, too, calls in friends and employees to ask them their opinions. And so on down the line. Suppose we call these people who pass judgment on these matters a jury. Is such a jury made up of friends or employees who live in a city like New York, Chicago, Philadelphia or even a smaller city, a competent jury to pass on these matters?

Advertising agencies and manufacturers may go further than this. They may submit their product or package to a dozen or possibly fifty families in the immediate vicinity of the home office of the agency or the manufacturing plant of the company. Is such a jury satisfactory?

Placements, as understood by the marketing research world, are quite a different matter. The product under consideration, or the packaging of it, is presented to a carefully chosen representative panel of consumers of the product. Such a panel is so selected that it represents in miniature the entire market involved.

The items placed in the hands of these ultimate consumers are identified only by numbers or letters with no inkling as to which company or artist or designer or producer is interested in their development. This makes for unbiased opinion. Without such placement tests, what happens? How many thousands of clever packages or package designs have so intrigued artists, designers, production managers and boards of directors that they have been put into production without actual knowledge of how the ultimate consumer will react to them? How many thousands of these have been short-lived, if the consumers did not react favorably?

It is a matter of record that, several years ago, very able artists, extremely clever designers, an old and experienced advertising agency and a well-known manufacturer produced such a remarkable innovation in a package that it won the packaging award of the year,

the medal of honor. The manufacturer increased his advertising appropriation, the advertising agency put on a big campaign and the product was widely distributed in this new and winning package.

The package was such an innovation that it did not fit in the family of products to which it belonged. It did not fit the usual place for this line of products on the grocer's shelves. If a housewife bought it and took it home, it did not fit in the place she usually kept these products, and so became lost and overlooked. It was passed by in the dealer's shop by those who were looking for that kind of product. If anybody, due to the stimulus of the advertising, did buy it and take it home, it became lost once more and was overlooked when the housewife reached for that type of product.

How long did it take the manufacturer to find this out? The huge advertising campaign encouraged many dealers to stock it. It enjoyed national distribution. Many housewives were encouraged to buy it. At first it moved off the shelves and into the homes in a fairly satisfactory manner.

Months later the dealers began to realize that they had little re-sale on the product. They found themselves loaded up with stock which they could not move. Slowly but surely the wholesalers and jobbers began to find themselves overstocked, and eventually the manufacturer discovered that his prize package was an extremely slow seller to a very thin market.

Carefully selected placements of this product in the homes of 250 to 500 representative housewives throughout the country, watched for a few months, would have predicted this situation. The only risk encountered by such a placement would have been the loss of time. It might have taken three or four months, possibly six months, to obtain dependable answers to this placement, but the saving would have been tremendous.

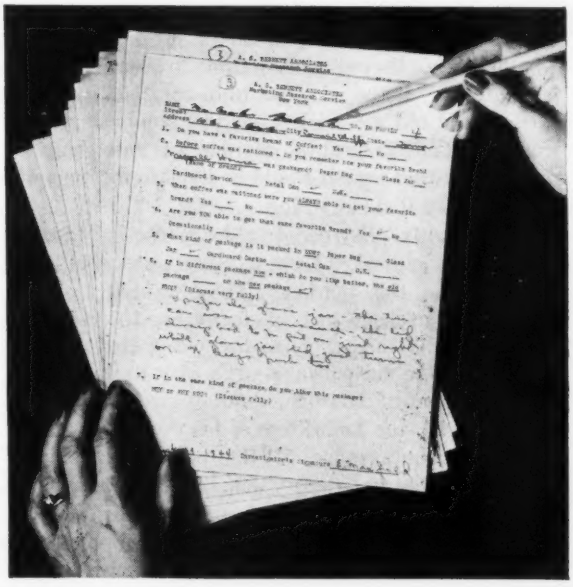
This method of testing by placements is particularly well adapted for new packages, untried items. What does marketing research have to offer to well-known and much-used existing packages? Packages may not change, but the framework of thinking of the consumer does change, particularly at this time. Undoubtedly, there are many packages in many lines which so perfectly meet the needs of the ultimate consumer that no change is necessary, no improvements required. But does this apply to all packages? Certainly not. How does the manufacturing company become aware of the changing framework of consumer thinking? The answer is that he learns the hard way. At first he cannot believe that sales are falling off, but finally, as the months and the years go by, it slowly dawns on him that he's out of step with the framework of thinking of his consumers, and often it's too late. Someone else, either by chance or by careful planning and study, has stolen a portion, if not most, of his market. This has happened over and over again, and many times loss of sales can be traced definitely to the package. New and better methods have stolen the market.

Marketing research does not take the place of art or design or mechanical skill, and it does not reflect on the achievements of these talents. If one starts up the furnace to heat his home, it's no reflection on the furnace if he consults the thermometer. If the shifting winds and the shining sun change the weather, it's no reflection on nature that one consults a barometer. Marketing research is the barometer or the radar of the manufacturing, advertising and selling world. It reveals the hazards before the head-on collision. It enables the business mariner to steer a safe course. With it he can take soundings as he proceeds; from it he can get warnings of impending difficulties. The use of marketing research need not wait until danger threatens or until new territories are to be explored. It can be used frequently and constantly as added insurance for successful operations.

Advances in technique

Marketing research in the past has not been free from making mistakes, and serious mistakes. Due to these early errors, it does not always enjoy the full confidence of management. Marketing research as a profession is now about 30 years old. From the very beginning it has steadily improved in its techniques and its methods. It is decidedly unfair to judge present-day marketing research methods by what happened ten years ago or even five years ago. Basically all marketing research studies rest on the dependability of the reports secured in the field. If the formula used in the interview is faulty, the instructions inadequate or the report incomplete or carelessly filled out, the entire study is useless. Many a marketing research man has learned this to his sorrow. Consequently, marketing research today has become a highly specialized profession. Like every other profession, the abilities of the practitioners vary. Any concern which decides to

2—Good questionnaire has simple form, direct questions and avoids ambiguous terms and long words.



spend a few hundred or a few thousand dollars interviewing possible customers or dealers or users for the purpose of arriving at a decision as to whether or not to start an operation which may involve half a million or a million dollars should not cast about lightly when looking for marketing research talent.

In the packaging field the amount of money necessary to conduct a worthwhile, dependable marketing research study is very little compared with the amount of money involved in planning boards, artists' studios, designers' studios and testing laboratories, to say nothing of the investment in machinery and material.

A careful examination of the various claims made in the advertising in this volume will reveal a long list of production "know-how" developments in material, technical skill, artistic talent, all designed to benefit the ultimate consumer. Practically every one of these claims can be explored by marketing research, either through placements or interviews with users.

There are times when it is unsafe to proceed as though nothing untoward could happen. Recently, one of the outstanding manufacturers of a certain type of packaging material came to a marketing research organization with a problem. His company, because of the shortage of another type of packaging material, had for two or three years enjoyed a very big contract with a manufacturer of a certain product. The sales of the product in the new type of package did not fall off. Everything seemed to be going along nicely. Why was the packaging concern worried? They were worried because they had no way of knowing what was going on in the thinking of the ultimate consumer of the product. They feared that with the end of the war and with the former packaging material once more available, the manufacturer of the product might cancel their contract. The packaging concern contacted the purchasing agent of the manufacturer, and that was as far as they could get. They realized that the purchasing agent might be giving them an order for another month's supply while on the floor above the board of directors of the manufacturing company might be holding a meeting to decide whether or not they should continue to use this particular material. If they decided to discontinue it and return to the old material, even the purchasing agent would not know it until the decision was written on the record. By that time it would be too late for the packaging concern to do anything.

Consequently, they came to the marketing research organization and asked them to sound out the ultimate consumers of this market. They wanted to know whether the package was satisfactory to the consumer or whether he might, with the old material available, prefer the old package. It's easy to understand that regardless of whether or not the consumer liked their material, the knowledge of his preference was of the utmost importance to the packaging concern. Armed with that knowledge, they could be forehanded. They might even know more about the matter than the manufacturer of the product himself. Supplied with this information, they could be of help to their client, hold his confidence and protect their own business; or, if the business could not be held, be in a position to plan accordingly ahead of time. And so marketing research became their radar, to stop a head-on collision or to avoid the difficulties in time to keep from making a crash-landing.

The ultimate consumer of the great bulk of all packaged goods is the individual man or woman. Quizzing these people about a package is a tricky undertaking.

When a person is asked about a package he or she will begin to talk about the product itself instead of the package. This situation must be overcome, and the solution must be a practical one. It should be so elemental that it will work successfully in the hands of thousands of part-time research workers in all sections of the country. When two strangers, the interviewer and the housewife, meet and exchange questions and answers, the whole performance is essentially a psychological one.

At the moment of contact, the interviewer will find that the mind of the respondent is either busy with some interest of her own at the moment or that she is apt to resist any effort by the interviewer to get her to do some thinking. The first problem then is to direct her undivided attention to the subject.

As one psychologist has said, "Close listening seems to be one of the hardest things in the world and misunderstanding the easiest." Therefore, the questions asked the housewife should be simple, direct, clear-cut, easily understood and intimately related to her experience, pride and prestige. The words used should be such that the interviewer and the respondent interpret them in as nearly the same way as possible. The very first question must preclude any misunderstanding.

Furthermore, for the sake of ensuring increasingly progressive understanding, it is helpful if each new question adds to the clearness of the discussion between the interviewer and the respondent, rather than to introduce the slightest confusion.

The problem of probing the consumer's mind on packaging problems requires a new and different technique. A search for recorded accomplishments or case histories on packaging research among consumers reveals astonishingly little of importance. It is a phase of marketing research which is wide open to those who elect to improve it. Its possibilities are endless.

The qualified marketing researcher can ascertain consumer response to color, size, design, convenience, economy, re-use, protection, label, dispenser, closure, directions for use, handiness of use, etc. The study can cover one's own line and all of his important competition. The results can be broken down as to sex, age, occupation, income group, geographical area, city size or special markets. Dealer response may be tabulated as to convenience, storage, handling, display, breakage, spoilage, customer appeal, price, etc. The results of such studies can be broken down as to types of distributors, character of outlets, methods of merchandising and pricing. Another aspect is advertising appeal as to consumer reactions, dealer response and cooperation.

The packaging department

by C. A. Southwick, Jr.

Finding the most effective package for a given product is far too complex a proposition to be treated casually. The controlling executives, of course, should have a sound knowledge of the product to be dealt with, and a broad understanding of packaging and material functions. But theirs is a supervisory function. The actual conduct of packaging is a full time activity which requires the services of a fully trained and experienced specialist.

Investigation of new materials, for instance, entails a tremendous amount of research and testing. Too frequently it has been the custom to delegate these activities to individuals or departments as secondary responsibilities. Material is too important an issue to be considered a side line. It is necessary for each successful packager to know how new materials fit into his specific set of package requirements. Not only must investigations and tests be conducted, but also the results of these tests must be evaluated in the light of data obtained from all of the other departments of the particular organization.

Similarly, every aspect of package development is entitled to fitting investigation and tests, and correlation of findings. No decision is sound unless all factors have been considered and analyzed as to their effects on the product as a whole.

The study of the various phases of packaging requires the services of men with widely different skills. It is, therefore, wise for the packager to obtain the best available help in each department, and to appoint a representative body which is competent to correlate data.

The responsibility and the size of departments are bound to vary in different organizations with the varying factors of the industry. In a small organization, one person may represent more than one phase of activity and in a large organization, each phase may require a group of individuals. The important thing is to have all factors governing good packaging properly covered and correlated. The various departments of an average industry and a successful system for their operation are described in the following paragraphs.

It has been shown that the pattern by which an organization operates is elastic. Nevertheless, in one form or another, each component must perform its specialized function which is then correlated with the work of all of the other groups.

Packaging committee

A body which would be competent to correlate the research findings and test results in all departments might be called the "Packaging Committee." Such a committee should consist of representation from each department of the organization.

Its responsibility should be to make recommendations after consideration of all the data available from all of the departments.

Purchasing department

This group has knowledge of material and package costs, availability of materials and sources of samples and production needs. The purchasing department must be given specifications by the production, the technical and art departments for the materials, packages and equipment to be obtained. The purchasing department should never be allowed to buy on price alone. Competitive products can be tested and approved before purchasing.

Art department

The art department may be a part of the company, or its work may be performed by an outside designer. In either case, its scope should cover the printing and other decorative phases of packaging. It will cooperate closely with the advertising and technical departments to satisfy the needs of each.

In many cases protective qualities can be combined with decorative, and these must be tested and approved by the technical group. The art department must not decide upon the package materials but must use those found suitable by the technical department. The art department should then write specifications for inks, type of printing, etc., and the grade and surface required for the purchasing department. It must also set standards of color and of quality which will be used for the guidance of the production department in package consideration.

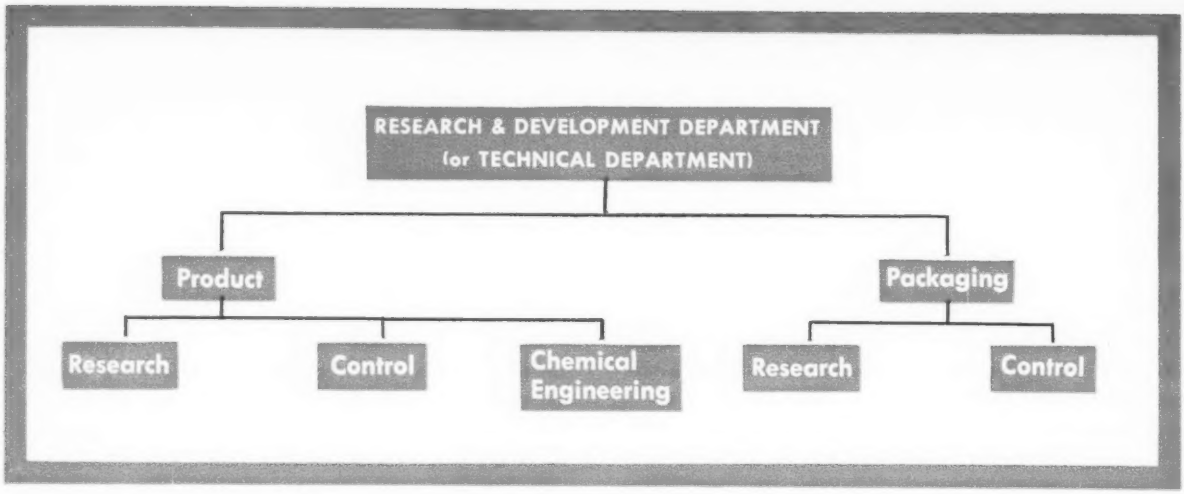
Sales department

This department supplies most of the problems as a result of its needs for new products, new packages for old products, changes in merchandising and competitive activity. It should furnish the facts on the ways and channnels of merchandising, the rate of turnover, the areas of distribution, etc. The committee work is primarily to satisfy the many demands and needs of this department.

Production department

This group must package products effectively and efficiently in the equipment, form and in the materials decided upon by the committee. For its own protection, it must cooperate with the technical department to set up standards of operating characteristic and control

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tests. Production specifications on both materials and finished packages are important for low-cost operation, reduction of loss of materials and for the development of uniform protective packages.

This department knows the limitations and productive capacity of its existing packaging equipment—a very important factor.

The technical department and production department must cooperate closely on product changes and control, on package and material specifications, and on the control of finished and filled packages.

Advertising department

This group supplies all the facts concerning the style and the decorative phases of the package. It also gives the data about the relationship of the package in question to the other products which are included in the general advertising program.

Consumers-service department

Whatever the name, this group should represent the consumers' requirements and viewpoints. Problems of size, opening devices or other conveniences, how the product is used and many more questions can be presented by this department. Such data and opinions may be formed by surveys and by a consumers' kitchen. Such representation on the package committee is important and necessary, but is very often forgotten.

Technical department

The most important single source of the full data concerning package and material functions is that scientifically trained group, the technical department. All divisions of this department must cooperate closely with each other, and with the production and purchasing departments on specifications and on control of the packaging materials.

The group is indispensable for indicating the materials and package forms which can be used for any given package problem. Its equipment, methods and personnel require careful consideration.

To operate effectively, the technical department must have laboratory facilities and personnel assigned entirely to packaging problems. The elaborateness of the equipment and the size of the staff will depend upon the nature of the company and the amount of work to be done. It must be recognized, however, that successful package testing requires special knowledge and special facilities. Proper interpretation and presentation of laboratory findings are as important as the tests themselves. This point is emphasized because in too many cases, packaging problems are assigned at random to incapable personnel or to inadequate laboratories with the result that necessary data and their correct interpretation are not obtained. It is to be hoped that the growing recognition of scientific package development will lead to official testing standards, and that it will also lead to proper provision for meeting the standards once they are established.

The packaging laboratory

Many firms have found that a laboratory devoted exclusively to packaging projects is a profitable investment, and a worthy adjunct for the packaging committee. Such a laboratory, well equipped and staffed, can be held responsible for a continuous flow of material and package test data to the packaging committee.

The following outline suggests the pattern and scope of such a laboratory:

1. Currently used packages and materials
   A. Control tests against specifications on
      1. Package materials purchased
      2. Packages as purchased
      3. Components for package use
      4. Finished and filled packages from production lines
      5. Unit machine operations in package manufacture or handling

B. Comparative tests of currently used packages, materials and equipment against
   1. Competitive packages
   2. New packages and materials offered by prospective or present suppliers
   3. Newly developed components or materials capable of similar function
   4. New or improved equipment

C. The responsibility for proper sampling and control technique

II. The development of specifications of currently used package materials and components

A. Complete mechanical specifications for package components
   1. Of strength and durability factors
   2. Of weight area and yield factors
   3. Composition and identification

B. Complete chemical specifications
   1. Of permeability values
   2. Of resistance to penetration by, and reaction to, various agents
   3. Other factors of minor importance

C. Complete manufacturing specification of package materials and operations
   1. Weights of applied coatings, adhesives, etc.
   2. Kind of machine and operating details

III. Specifications of currently used finished packages

A. Mechanical specifications
   1. Package form, dimensions, composition
   2. Strength and durability factors
   3. Weights and areas of all component parts and elements

B. Chemical specifications—Length of protection of contents under deteriorating conditions
   1. At normal conditions with usual product
   2. At accelerated conditions with
      a) Usual product
      b) Comparative contents such as $CaCl_2$, etc.

C. Manufacturing specifications
   1. Kind and operating details of filling, forming, closing and similar equipment and operations
   2. Data on temperature, time and pressures of heat sealers or composition and the weight of adhesives

IV. Research on new package forms and materials

A. Comparative tests against current materials
   1. Mechanical and operational factors
   2. Chemical functions
   3. The development of improved and new methods of testing and evaluation

V. Research and testing for the various packaging characteristics

A. Tests to evaluate mechanical properties
   1. Density
   2. Abrasiveness
   3. Other mechanical properties

B. Tests to evaluate chemical properties
   1. Degree and rate of effect of outside deteriorating elements
      a) Water vapor
      b) Water
      c) Air and other gases
      d) Age and light
      e) Other factors
   2. Degree and rate of product deterioration by the
      a) Loss of volatile components
      b) Change of state
      c) Temperature
      d) Other factors

This pattern of the scope and activity of the packaging laboratory is not complete in every detail, but broadly covers the kind of work for which the laboratory must be staffed and equipped. Obviously, a technically trained person must check and supervise such laboratory operations and also compile and report the laboratory data into readable and useful conclusions. Many of the standardized tests and routine control work can be performed by assistants having manual dexterity and good training but no technical education.

While this pattern looks very formidable, it must be realized that it is not necessary to conduct all tests and operations at once and that the complete story on a material or package proceeds stepwise as the basic tests are found acceptable. The failure of a package to meet quick tests eliminates it.

However, complete data and control values should be available on all materials, packages and products that are in current use and for those which it is possible to consider as substitutes.

A complete set of data and continuous flow of control reports will:

1. Ensure the most efficient use of materials and the guarantee of product protection
2. Allow the purchasing department to obtain materials at the lowest price compatible with satisfactory performance
3. Prevent suppliers from degrading quality or making substandard shipments
4. Make it possible to make changes and substitutions without danger of losses

The laboratory equipment is divided into two classes:

1. Instruments and equipment for making tests of package materials, components, physical tests, product tests
2. Cabinets or rooms of controlled atmospheres for making accelerated package and product tests

Both classes include standard equipment or instruments for some of the testing, while special or improvised equipment is necessary for some of the phases involving new techniques or unusual storage conditions. As the science of packaging develops, standardized tests and equipment for performing them will become available. Until then, a packaging laboratory should standardize all of its own procedures.

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On such a basis, a packaging laboratory can contribute effectively to the work that is done by a packaging committee.

The ideal operation

An over-all picture of the system in operation is given as follows:

The packaging committee should be composed of one person assigned from each department. It is preferable that the same person attend all meetings unless the company is so large that some departments must send different people for different groups of products. Such a situation could exist in sales or advertising, but should not arise in the production, purchasing, consumers-service or art departments, and must not happen in the case of the technical department. It is most satisfactory to assign a permanent member from each group, and to call before the committee other persons particularly concerned with the problem at hand.

The committee should have a secretary whose duty is to report the facts and opinions presented and the final conclusion of the meetings. Obviously, as many packaging materials, designs and forms as appear practical, together with cost and production data, should be reported to the executive group before the final decision.

The packaging committee should meet at the same time each week with special or task group meetings as required. The sequence of operation could be:

The member from the sales department presents at a committee meeting the problem of packaging a new product just developed by the research department. Next, the product is described and its chemical and physical properties are given by a member of the research department. The sales department then describes where and how it would like to market the product. The consumers-service member tells how the product is to be used in the home. The technical member of the committee is then assigned to get samples of the new product, find its special requirements, make package tests and recommend materials.

This assignment concludes the discussion of the new product at the committee meeting. At the next meeting, the production department presents facts on the cost of the product, the sales department tells the two sizes of packages it requires and the consumers-service adds certain facts on home uses.

The technical department, meanwhile, has determined some of the product's characteristics, but does not have package data. At subsequent weekly meetings some additional data are accumulated, but no serious discussion occurs until the sixth meeting when the technical department presents the results of package tests. This report covers several package forms and a variety of material combinations. The sample packages have been exposed to deteriorating influences, both physical and chemical. The conclusion shows certain product characteristics which allow the committee to decide upon a type of package and a level of protection best suited to the particular type of product.

The art department is given the task of color, design, etc. The production department then is assigned the task of surveying the cost of new equipment and other factors, while the technical department makes additional tests of a greater number of material combinations of the approved package form. These results are reported in six weeks (the twelfth meeting from the start of the problem). At this meeting the three best package combinations are turned over to the art department for samples in the colors and designs which have been tentatively approved. The purchasing department and production department are given tentative material specifications, both mechanical and chemical, to obtain costs. The production department also reports on the necessary equipment for production of the yearly quantity estimated by the sales department. Meanwhile, the technical department has started another series of tests for confirmation of the previous tests, so that more complete data will be available to the entire group.

At the fourteenth weekly meeting, the complete report giving recommendations, designs, costs and specifications is presented for final decision to the controlling executives. Actually, this is a rather simplified procedure, but it is a pattern for the proper sequence and operation of an efficient fact-finding packaging committee. Additional activities should be determined by the requirements of the individual concern.

The final decision

The final decision is made from laboratory-test data, sales and advertising requirements, cost considerations, manufacturing needs, and appearance and convenience factors. All these elements are present in every package change, and each must be weighed as objectively as possible. Here is a proved way to eliminate guesswork and achieve packaging in a rational manner.

Application of the plan

That the foregoing outline presents the basis for a workable plan has been demonstrated by the Eastman Kodak Co., where there has been recently installed one of the most comprehensive packaging organization setups ever attempted in American industry. The plan covers the writing of detailed specifications for more than 35,000 different packages and a program of coordination and package service for every phase of packaging operations throughout the company's three plants in Rochester.

Proceeding on the thesis that to assure good packages, a company-wide system of coordination and control is essential, the authors of the Kodak package organization plan felt that to meet this company's problems, such coordination and control logically divides under two groups which they have called Physical Package Service (a division of the Industrial Engineering Dept.), covering the physical structure and pro-

duction aspects, and Package Design Service, covering appearance and consumer use aspects. Two representatives of company management have been appointed, one to whom Physical Package Service will report and the other to whom Package Design Service will report.

The basic instrument of this system of coordination and package service is a General Package Specification Approval known as GPSA. As a "specification-approval," this incorporates the company's former package approval card system and, in addition, carries specific information covering the method of completely packaging any given product for shipment.

Headquarters of the Physical Package Service are located at Kodak Park, because the majority of the packages are fabricated there. The company makes most of its own boxes, cartons, some metal containers, bags and envelopes. It is also felt desirable to have this service at Kodak Park because materials for much of the packaging for all the plants are procured through the Kodak Park purchasing department. There are also in existence at Kodak Park certain facilities for specialized testing of materials and packages not available in the other plants.

Physical Package Service has a fully equipped Package Proving Room to conduct tests on packages and packaging materials in addition to those conducted by the departments packaging the products. This proving room is equipped with all necessary facilities for package development and testing in accordance with approved scientific methods. It also has access to specialized testing facilities now in existence at Kodak Park.

Personnel of the Physical Package Service group, which is to be considerably augmented in the future, consists of the supervisor, laboratory technicians and assistants, specifications writers, a shipping case designer and clerical staff.

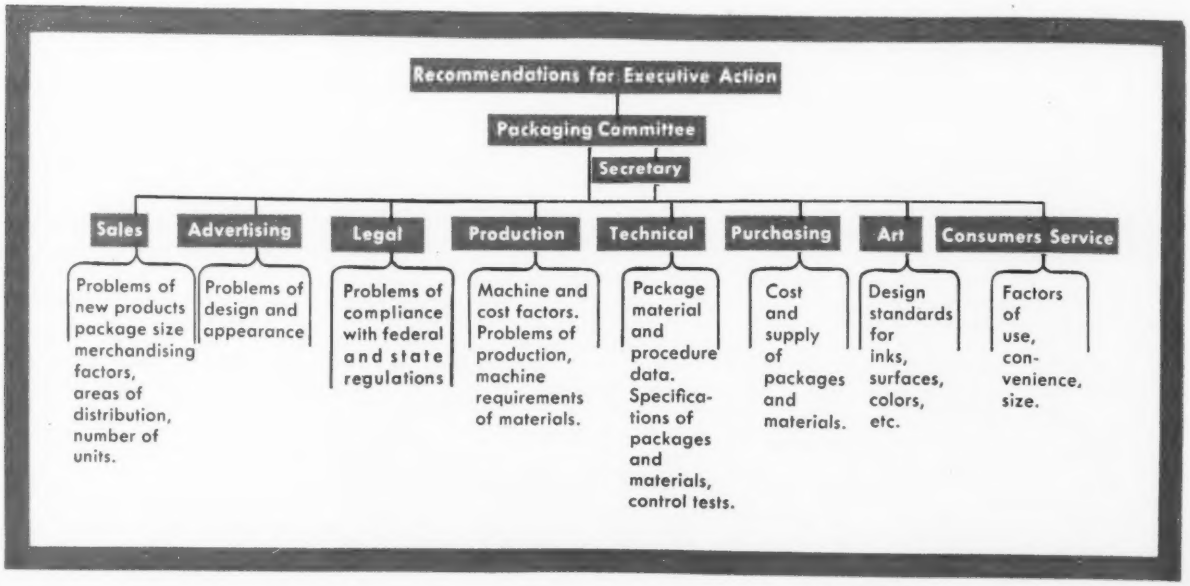
Headquarters of the Package Design Service is located at Kodak Office. In carrying out its functions it is thus in close contact with sales, advertising, market research, patent and legal, development, general production, art and engraving departments, all of which are in this location. This group is also a central source of packaging information for all plants, independent of the manufacturing departments.

Personnel for this group consists of the supervisor, assistant to supervisor, specifications editor, designer and clerical staff.

All departments are supplied with the GPSA forms (General Package Specification Approval) on which all revisions are submitted for approval. Recommendations for revision may originate in the department packaging a product. In this case, the department, through its plant packaging representative, sends the GPSA forms, together with a sample of the recommendation (or with a request that the packaging recommendation be supplied by the Physical Package Service) to Physical Package Service.

If a recommendation for package revision originates at Kodak Office through sales, advertising or legal departments, it is referred to Package Design Service. If the recommendation involves a physical change it is passed on to Physical Package Service in order to check on the feasibility of the revision.

All product approvals or advance notice thereof are routed to both Physical Package Service and Package Design Service for signature. As soon as Package Design Service signs product approval the department packaging the new product is requested to submit recommendations for the package. The department packaging the new product either (a) submits the recommendation for the package to Physical Package Service or (b) requests that the package be developed by Physical Package Service. Approval is then obtained by the same procedure as outlined under the revision of packages above.



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Testing package materials and packages

by D. Reid Weedon, Jr.

The testing of packages and their component materials is almost entirely directed toward determination of the functional properties of the packages and toward elimination of expensive guesswork during package production.

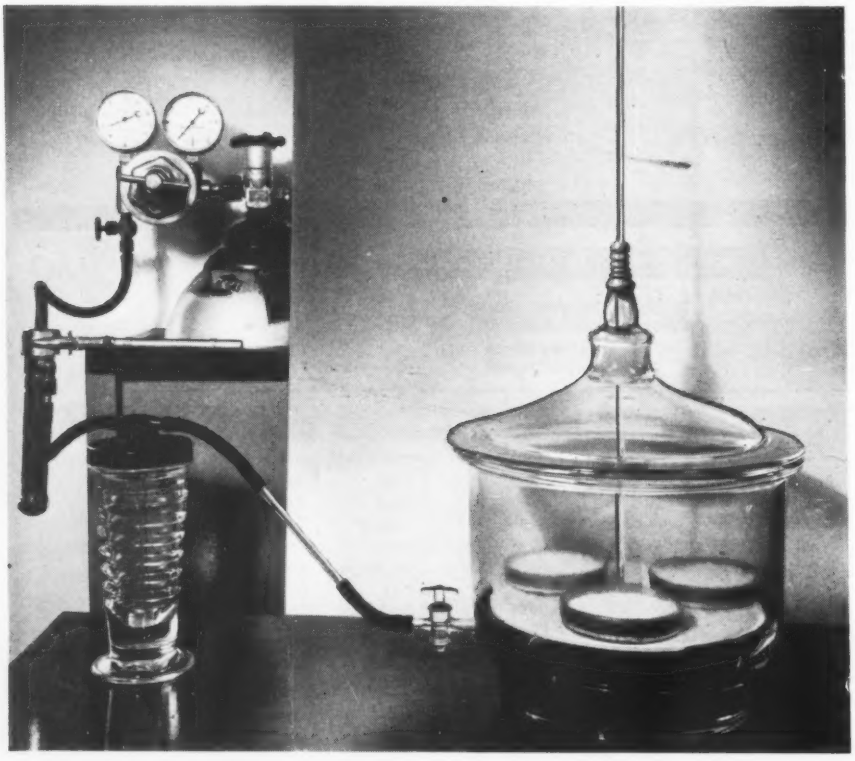
The key word in this statement is "functional." Indicative of the goal of the packaging industry in recent years has been the widespread use of the word by packaging engineers to describe packaging which is designed and developed expressly to perform specific duties. Testing is essential to such a program, and the extent to which "functional" will continue to be applicable to packaging will depend largely upon the amount of research and testing which is done during the postwar period.

Testing was of particular help in overcoming problems brought about by the recent war. Some of these problems resulted from unfavorable handling and storage of war supplies, and the adverse atmospheric conditions to which they were frequently subjected. Others were due to shortages of many standard packaging materials, necessitating selection of substitutes. In either case, the task of the testing laboratory was to develop a package which would adequately perform the functions required for a particular packaging application.

During the war, engineers went directly to the core of packaging problems and designed what they considered to be the most complete packaging specifications for the contents at hand. Specifications were often issued when even suitable laboratory samples did not exist. However, these specifications did tell the research engineer the specific functions required of the package. New testing methods were also developed during this period. For the most part, tests were sufficiently detailed and conditions were reasonably reproducible. Through continual research, practically every established requirement level was achieved, maintained and, in certain notable instances where still better performance was desired, markedly exceeded.

The extremely high percentage of perfect packages required by the Government for war supplies is often not economically practicable for civilian competitive production. Particularly when the packaging cost is a large portion of the total cost of a product, protection by more expensive packaging is not justified unless the cost of replacing those items which fail due to inadequate protection exceeds the cost difference between the two packages. There is always room for improvement, but improvement is not always economically desirable. However, in a relatively inexpensive, but properly planned test program, evaluation of the test data in the light of past experience will provide concrete in-

PHOTO, COURTESY ALUMINUM CO. OF AMERICA



1—Apparatus for measuring permeability of films to carbon dioxide. The wash bottle is omitted when dry carbon dioxide is employed. Desiccator should be installed in constant temperature cabinet for close temperature control. By use of racks in desiccator, additional test cups are accommodated.

formation which may be used to determine the relative economics of using the present package or adopting a new one.

Purpose of testing

Testing provides an inexpensive means for obtaining a quantitative measure of performance based on controlled small-scale trials. This is the basic purpose of all testing. Because tests are invariably conducted on a small scale, it should be realized that the word "controlled" is extremely significant.

Many extensive test programs are of little value because the conditions have been inadvertently altered or because the testing equipment is not sufficiently accurate. Somewhat less frequently, test conditions or equipment are unnecessarily accurate for the materials being tested. This not only adds to the expense of the test, but also implies a false degree of uniformity unless the results are properly reported.

In general, packaging tests are made by or for either the producers of packages or the users of packages. The manufacturer of package materials or packages should conduct tests which include:

1. Research on new packages and their component parts
2. Quality control of production
3. Improvement of current products

The user of the packages should conduct tests to determine these facts:

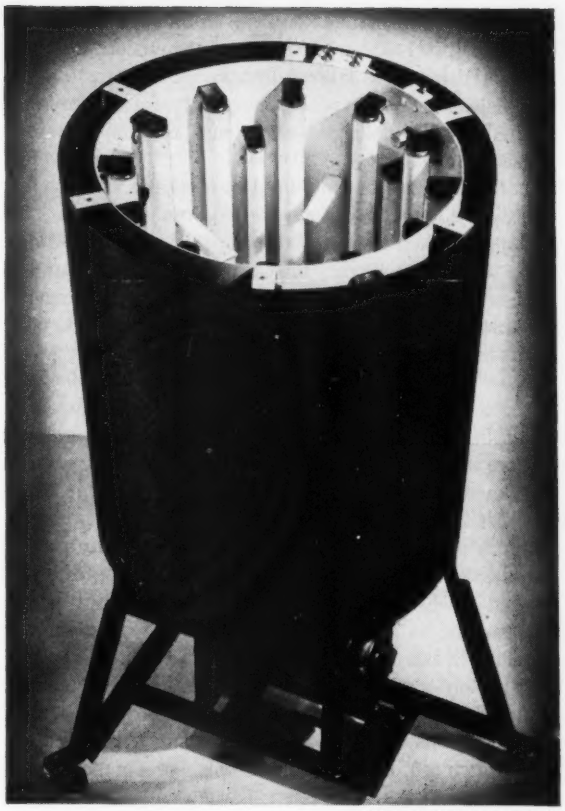
1. The performance levels required
2. The materials which reach these required levels of performance
3. The adaptability of the packages to his products
4. Satisfactory methods for inspecting packages at the time of receipt and also after filling and closing

These groups are not all-inclusive, but they do present the general aims of the majority of those who are concerned with testing.

In all cases, the planning and evaluation of a testing program require experienced technical personnel. Previous results or performance data are usually available, and must be included in any evaluation of laboratory tests. Experience gained from the use of a similar package is most reliable as a control for comparative purposes. Otherwise, experienced judgment alone or, as a last resort, a field trial, must be utilized to evaluate laboratory results. The difficulties involved in recording results, the numerous unknown factors and the length of time required generally make field trials unreliable and, therefore, undesirable.

Standardization of testing methods

With the end of the war and the lifting of restrictions on materials, the packaging manufacturer is presented with an unparalleled number of new and promising materials with which to work. Each manufacturer who expects his package to pay dividends must choose the material or combination of materials which will produce the most satisfactory package for his purpose at the minimum cost.



PHOTO, COURTESY LEVER BROS. CO.

2—A machine used for testing the effect of light on food products packed in 1-lb. glass jars.

In order to conduct research and development to this end, it will be necessary to carry out a selected group of tests on a number of combinations of materials and methods of fabrication, and to adapt these results to the selection of an improved combination or fabrication. Such a research program must be conducted in an orderly manner, with each phase sufficiently sound to permit its use as a stepping stone for future work. The tests must provide numerical and reproducible results which measure the properties of the material or the package.

To date, there has been little or no standardization either of the tests used to determine the package requirements of the contents, or of the tests involving the finished and filled package. However, the Technical Association of the Pulp and Paper Industry (TAPPI) has established the basic test methods for many properties of materials used in the fabrication of packages. These methods provide a certain fundamental vocabulary of definitions. Thus, tests on the package materials themselves, at least, may be compared and discussed on the basis of standard methods.

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A collection of tests can never be entirely complete and final. However, with constant revision, it can present the best available information. A test, once established, also provides opportunity for improvement based on the collected experience of many engineers and technicians.

Standardization should not be used as a shield against the development of new testing methods and their adoption when their usefulness has been proved. Since any test is an arbitrary measure of performance and not necessarily the exact measure of service performance, it is always possible to develop other arbitrary tests which are theoretically equally indicative of service performance. However, until a new method is found to provide a more accurate index of service performance, an established method is preferable. In those instances where there is no suitable established test, it is necessary to develop a special one. In the development of any test, it is important to consider each of the important factors previously mentioned—namely, definitions, reproducibility and numerical results. In addition to these considerations, it is important that a testing method be as free as possible from extraneous factors which will introduce errors into the results.

The various tests which are applicable to packaging fall into three general categories: contents tests, package-materials tests and package tests. Of the three, far too much emphasis is often placed upon package-materials tests, which can be misleading unless interpreted in the light of tests on, or experience with, the specific contents and the completed package.

Contents tests

Especially when a new package is being designed for a product, or when the product is modified, tests made on the contents will enable the determination of package requirements. The manufacturer of any product desires a package having such protective properties and design that the contents are presented and delivered to the consumer in the most acceptable manner. Therefore, the product to be packaged should be investigated and tested before available package materials or completed packages are tested. The proper package can be selected only with a prior knowledge of the package requirements of the contents. Considerable work remains to be done toward standardization of even the mechanical tests of contents. Among those most frequently required are tests of bulking, density, abrasiveness and fragility.

As a group, the chemical tests on the contents are usually most important, particularly when neither glass nor metal is to be used for the package. One of the important requirements, for which several testing methods already exist, is the determination of the equilibrium humidity of the contents. Particularly in complex structures, the relative humidity inside the package has considerable bearing upon performance of the package. A knowledge of the equilibrium humidity of the contents will give the experienced package designer information upon which to base the selection of the material or coating best suited for the inside of the package. Information must also be obtained regarding availability of free liquids and gases.

In many cases, it will be necessary to study the chemical activity of the contents to determine specifically what liquids or gases are exuded upon aging. The all-important index of failure of the contents must also be determined, together with the primary and contributing factors toward that deterioration. With this index and a knowledge of the desired length of the combined storage and shelf life, the degree of protection which the package must provide can be established.

The visual test most frequently made in connection with the contents is for the purpose of deciding whether to display the contents by using a transparent package. This is not a laboratory test. It is a test of consumer acceptability and should therefore reflect the opinion of the public.

Thus, contents tests are useful in initially qualifying a package, and usually need be conducted only when the contents are first produced and each time they are modified thereafter. Exceptions are tests used to provide an index of failure. These must be made on the contents of completed packages after storage. Storage tests will be discussed under the section on package tests.

Package-materials tests

Package-materials tests are the tests most commonly used in connection with packaging. They are useful for investigating the characteristics of numerous materials which may be suitable for packaging. They are also used to ascertain rapidly the maintenance of protective properties at each stage of production.

The Technical Association of the Pulp and Paper Industry has done much to standardize the package-materials tests. In so far as applicable, the conditions established in the TAPPI standards should be used as the foundation for all materials tests. For instance, adherence to the standard laboratory conditions of 73 deg. F. and 50 per cent R. H. should be strictly practiced unless the use of a special temperature or humidity condition is indicated, as in testing materials for packaging of frozen foods.

Tests of mensuration are perhaps the simplest of the materials tests. They include the determination of thickness and weight per unit area. From a knowledge of these two qualities, the ream weight, density and specific gravity all may be computed. However, even in determining these two seemingly unmistakable properties, there are two pitfalls. The first danger, applicable to all materials to some extent, and especially to organic materials, is that temperature and sometimes relative humidity affect the dimensions of materials. For this reason, mensuration tests, on cellulosic materials in particular, should always be performed on samples which have been allowed to come to equilibrium with the established standard conditions of temperature

and relative humidity. Only by following this procedure can absolutely reproducible results be obtained.

The second danger occurs when tests of mensuration are applied to the individual components of a multiply laminated structure. Measurement of the relative amounts of each component requires a meticulous separation and analysis of the structure. Such determinations require careful techniques to obtain significant results, since frequently the quantities determined even on large samples will be extremely small.

There are a great many mechanical tests which are used for package materials. The tests applicable in a particular instance depend upon the type of material under consideration (i.e., paper, glass, adhesive, plastic, metal) and the properties that are of immediate concern. The properties of most general interest are: bursting strength, tensile strength and elongation (wet and dry), tearing strength, seal strength, folding endurance, blocking characteristics, softness, flexibility, abrasion resistance and useful temperature range. There are standard TAPPI testing methods for most of these properties, and it is hoped that methods for the others will be standardized. The outlook for standardization is especially promising at this time, because of the experience gained with a wide variety of test methods called for in wartime specifications.

Many new chemical tests for packaging materials have also been proposed recently and have received varying degrees of acceptance. The purpose here is not to endorse or condemn any one method. However, it is important that standard methods be adopted which will enable a scientific determination of the hitherto vague, but nonetheless significant, properties of permeability to water vapor, air and other gases, including organic aromas; resistance to specific oils and greases; relative aging characteristics of various materials.

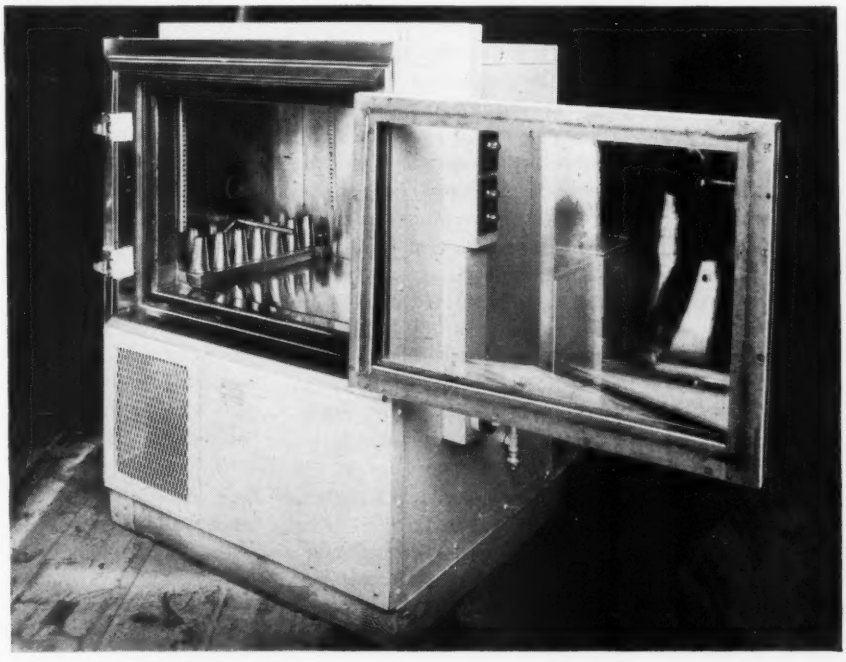
In the case of most packaging materials, all of the above properties are affected markedly by temperature. It is, therefore, very important to select test conditions which accelerate the rate, but as nearly as possible duplicate the effect, of normal service. For instance, in the case of a packaging material for use with frozen foods, all tests should be conducted at 0 deg. F., for it has been found that the relative merit of materials tested at 73 deg. F. is no index of their relative performance at 0 deg. F.

Certain chemical tests do not indicate actual performance because test conditions do not correspond to service conditions. The standard method for determining resistance to grease and oil involves use of the turpentine test. Yet tests involving the use of lard, butter, cocoa butter, chicken fat, mineral oil, etc., indicate that resistance of a material to one grease or oil may show no correlation with resistance of the same material to a different grease or oil. Thus, the common practice of considering greaseproofness as a single measurable property must be abolished in the light of additional scientific data.

Somewhat less striking, but of great importance, is the knowledge that water-vapor transmission is dependent upon the relative humidity on each side of the barrier and upon the usually more influential factor of the vapor pressure differential. Often, when the equilibrium humidity of the contents is known, a combination of packaging materials can be selected which will take advantage of the foregoing property.

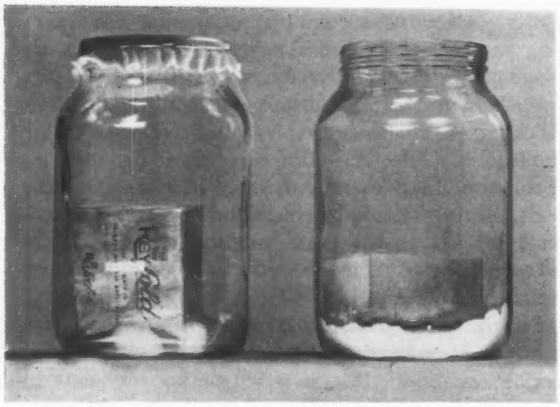
A test for the determination of aging characteristics requires the precise selection, application and control of the particular aging factor under consideration. In service, packaging materials usually age or deteriorate

PHOTO, COURTESY PACKAGE MATERIALS LABORATORIES



3—Used for determining the water-vaporproofness of various packages, this cabinet operates at high and very low temperatures and at the entire range of humidity. It has 4.25 cu. ft. capacity.

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PHOTOS 4 AND 5, COURTESY DIV. OF ENTOMOLOGY AND PARASITOLOGY, UNIV. OF CALIFORNIA

4—Testing packets made of metal foil laminations for insect penetrability, using gallon glass jars.

as a result of temperature (high or low), light (particularly ultraviolet) and corrosion (especially due to oxidation). In determining the aging resistance of a material, usually no one of these factors can be singled out. Rather the test method must include each factor to a selected degree. For this reason, aging tests should be carried out by technical personnel possessing a wide background of experience, and the results should be scientifically checked against service results as soon as possible. It is generally agreed that truly indicative accelerated aging tests are among the most difficult tests to develop.

The visual properties of most materials undergo marked changes as a result of aging. Therefore, variation in visual characteristics can frequently be used as a significant index of deterioration.

In the group of visual tests that are applicable to packaging materials, many can be conducted in a laboratory on a quantitative basis by well-established methods. Reflectivity, color, transparency or opacity, and smoothness are among the properties most frequently determined. The test equipment necessary for the measurement of these properties is generally expensive. However, qualitative values may be obtained by direct visual comparison between an unknown and a previously established standard. Once standard samples representing the upper and lower limits of the usable range of a property have been established, it is adequate for most purposes merely to make a visual comparison between these standards and the unknown to decide the latter's suitability. In any controversy between observers, resort should be had to an optical instrument capable of measuring the property in question. Such measurements can be made in a matter of minutes.

Package tests

In the final analysis, the suitability of a combination of packaging materials is shown by the performance, cost and acceptability of the package. Of the three, performance is of most importance at this time.

The selection of tests used to indicate performance is based upon the previously determined characteristics of the contents and of the package materials. Since the completed package embodies all of the advantageous attributes as well as the undesirable qualities of the combination of the packaging materials and the contents, an interpretation of the results of package tests must reflect all available knowledge of these components. In many instances, results obtained by testing one or two filled packages without adequate controls prove to be erroneous. Before commencing a package testing program, it is well to understand the variables occurring as a result of combining the properties of various packaging materials and contents.

In spite of the considerable amount of development and standardization of mechanical tests for tumbling, impact and compression of outer containers (see *Testing Shipping Containers*, p. 859), development of such tests for consumer unit packages has received very little attention. The mechanical strength of a package must be sufficient, not only to hold the contents when a group of packages is protected by an outer container, but also to hold and protect the contents while the package is being handled as an individual unit.

During the recent period of wartime restrictions and shortages, a wide variety of materials was combined into thitherto unheard of package constructions. A wealth of performance experience was obtained with these new packages, which were tried with but little preliminary testing. This is an uneconomical procedure and one which may never again be justified; however, much of the information so gained could be turned to advantage if it were used to spur the development of definitions, test methods and standards for the mechanical properties of packages. It is suggested that the packages also be subjected to a specific series of rough handlings prior to being tested for chemical performance and visual properties.

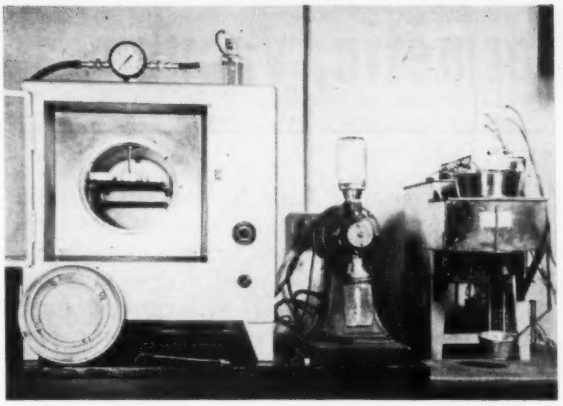
Chemical tests for packages consist of modifications of those for package materials, in order to include variations introduced by fabrication and closures, together with a repetition of the tests which provide the previously mentioned index of failure for the contents. Other than a test to ensure that the package itself has no detrimental effect on the contents, all of the chemical tests on packages will be concerned with determination of the permeability of the completed package to water, oil, grease, water vapor, gases, aromas, etc., and the effect of these agents on the contents, expressed in terms of the time and storage conditions in which the contents become unusable. A little experimentation has been conducted along these lines, but there has been only cursory standardization of test conditions.

Tests designed for determining permeability of package materials to water, oil and grease may be rather easily adapted to reveal similar information with respect to completed packages. However, in the case of packages, these results must be interpreted in the light of expected storage conditions. In wartime, the Government established various exposure conditions

which were believed to be suitable equivalents for anticipated actual storage periods and atmospheres. Actually, these laboratory exposures were substitutes for the real thing and, since they were designed to accelerate aging, they bore little relationship to service conditions. However, they did provide specific reproducible cycles which permitted the direct comparison of various packages within a reasonable length of time. In peacetime, storage conditions for most packaged products will be much less severe than during the war. Thus, wartime testing at high temperatures of 120–160 deg. F. will be supplanted by more widespread testing at 100 deg. F. The problem of selecting testing conditions in a particular instance is still further simplified at present because the general geographical destination of the product can usually be determined at the time of packaging, thus eliminating the necessity for the multiclimate packaging so often required for war supplies. Not only is this an aid in testing, but it also often enables the design of an adequate or superior package for any one climate at a considerably lower over-all cost.

In testing packages for serviceability, the amount of water vapor in the air and the temperature are the principal concerns. The control and measurement of temperature for test purposes are relatively easy; however, quite the reverse is true regarding the relative humidity. Variations of several per cent in the relative humidity in the low ranges are of little consequence, but in the high ranges considerable precaution must be taken to preclude the possibility of getting condensation of water which occurs at 100 per cent relative humidity level. Most packages behave quite differently toward water vapor, as distinguished from liquid water. Therefore, it is of the utmost importance that tests involving exposure of packages to water vapor and to liquid water be conducted separately.

The conditions of relative humidity and temperature selected for the controlled atmosphere or series of controlled atmospheres for package storage tests are arbitrary, and eventually may have to be modified in accordance with service experience. Two different contents, A and B, when packaged in containers having similar water-vapor transmission rates and subjected to the same controlled test atmospheres of 100 deg. F. and 90 per cent R. H., may both remain usable for equal lengths of time. However, in service, content A may remain usable for six months and content B for an indefinite period. Seemingly, this would indicate an error in testing, but actually both the test results and service findings may well be correct. As a simple illustration, let us assume that contents tests indicated that both contents were subject to spoilage due to water vapor. Furthermore, let us assume that other tests revealed an equilibrium relative humidity of 10 per cent for A and 40 per cent for B. If the service conditions were 70 deg. F. and 40 per cent R.H., only A would attract moisture. Under these conditions there would be no change in moisture content and therefore no spoilage of content B. Here, then, is an example of the inconsistencies that occur when improperly evaluated package storage tests are used to estimate the service life.



5—Vacuum chamber, coffee mill and moisture tester for studies of cereals and dehydrated foods.

The experienced investigator will select storage test atmospheres which assure significant as well as accelerated results. However, since test atmospheres are arbitrary, considered selection could be made from a relatively small group of standard conditions. Such a standardized set of conditions would include, at one extreme, two atmospheres with a temperature of 0 deg. F., one with a relative humidity in equilibrium with ice and the other with a low relative humidity. For other products, the standard paper-testing room condition of 73 deg. F. and 50 per cent R. H. is most satisfactory. Two high-temperature (100 deg. F.) atmospheres—with 40 per cent R. H. and with 90 per cent R.H.—should complete an initial set of standard conditions. Comparative testing, which is difficult at present because of the numerous test conditions being used, would be greatly aided by adoption of such a set of standard conditions.

Visual tests for packages include those applicable to package materials, together with evaluation of the aging characteristics after handling and exposure of the package and evaluation of consumer acceptance.

Planned testing programs

Planned testing programs, involving the testing not only of the package materials but also of the contents and of the filled packages, have paid dividends to those who persisted. However, much remains to be done to reduce the breakage and the loss of freshness, strength, weight and flavor between the initial closing of the package and the consumption of its contents. It is reasonable to assume that both the package manufacturer and the contents manufacturer who scientifically conduct packaging research and inspection programs in order to make full utilization of new and old materials and methods, will increase the efficiency and economy of packaging. For both, as competition once again becomes keen, such a testing program may well mean the difference between failure and success.

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Hermetic, vacuum and gas packaging

by John H. Nair

The art of preserving foods in hermetically sealed containers with or without the application of heat, vacuum or inert gas dates back to the Napoleonic era. The French government awarded a prize of 12,000 francs in 1809 to Nicolas Appert for his process of preserving food in glass bottles which were immersed in boiling water for varying lengths of time. Appert is thus looked upon as the "father of canning." At about the same time, Thomas Saddington in England devised a preserving process for fruit which involved packing food in bottles, stoppering lightly with a cork, heating in water and holding at boiling temperature, filling the bottle with scalding water and stoppering. The term "hermetically sealed" was devised to describe such a method of sealing food in a container. The term derives from Hermes, the god of secrets in Greek mythology.

Hermetic sealing

The term will have a different implication depending upon whether the container, when sealed, has pressure or vacuum. The first British patent, No. 3372, for preserving animal and vegetable food in hermetically sealed containers was issued in 1810 to Peter Durand. His method was quite similar to that of Saddington but covered the use of pottery, tin and other suitable metals in addition to glass. Canning in the United States was probably first introduced by William Underwood, an Englishman, who began operations in Boston about 1821 using the Appert method in glass bottles. Tin as a replacement for the glass bottles is believed to have been first used in the United States about 1838 by Charles Mitchell, a Scotsman, who packed corn and lobster in tin near Eastport, Maine. The use of tin greatly stimulated the canning industry which by 1895 was packing 175,000,000 cans of fish and 192,000,000 cans of corn and tomatoes annually. The method followed was essentially like the one introduced by Appert, the cans being packed, sealed, heated, tapped to expel the air, resealed and boiled for three hours.

Despite the work of Pasteur, which developed the bacterial theory of food decomposition, the belief persisted that the creation of a vacuum was the essential step in canning. Even the noted scientist, Gay-Lussac,[1] believed that food decomposition resulted from a series of oxidations, and hence, that the more air kept out the better. About the turn of the century, the American canners became quite worried about the incidence of spoilage indicated by "swells," resulting from gaseous fermentation of the can contents. Experimental work on canned peas by H. L. Russell[1] at the Wisconsin Experiment Station emphasized the necessity of higher temperatures during processing to destroy all bacterial life. Systematic studies in other laboratories over a period of years have developed reasonably exact information on the times and temperatures necessary for heat penetration and spore destruction in the various types of foodstuff.

Further improvements in processing methods have been largely concerned with getting the air out of food and preventing pinholing. In the method patented by W. S. Sellars in 1918,[2] the air and gas are exhausted from the container of fruit and replaced with a liquid or sirup before the container is sealed. As a result, it is claimed that no gas or air is expelled from the fruit cells during processing, and that, consequently, no shrinkage occurs during cooling and every can remains full, the fruit being firm though water-logged. In 1925 a patent[3] was issued to Grab for a modification of Sellars' method, whereby the fruit is subjected to steam while in the vacuum. Steam replaces the gas and drives it off, but when the fruit cools it collapses and shrinks. The method does avoid the saturation of the fruit with water. Under Hansen's patent,[4] issued in 1927, the fruit is filled into cans which are automatically closed and evacuated. The vacuum is relieved by steam and sirup is poured in to fill the space and condense the steam. After this operation has been completed, the can is permanently sealed.

Vacuum packing

The first U. S. patent for sealing cans in vacuum was issued in 1852.[5] The operation consisted of placing a tin disk on the opening of the can and fastening it in place with bits of solder. Several other patents embodying similar ideas were issued in the next few years, but all were very complicated and were not suitable to be used commercially.

A roaster of coffee in 1899 discovered that coffee kept better when packed in tin from which air had been excluded. But it was not until about 1910 that the Thomas Cap Corp. on the Pacific coast tried vacuum packing of a foodstuff commercially. The material was butter, but the experiment was not considered worth while and was abandoned. The first coffee to be successfully vacuum-packed on a commercial scale was probably put up by Hill Brothers in San Francisco about 1913. This was packed in tin, but no vacuum actually resulted because there was no realization of the effect of the carbon dioxide given off by coffee after it has been roasted.

[1] Arvill Wayne Bitting, *Appertizing; or The Art of Canning; Its History and Development* (San Francisco, The Trade Pressroom, 1937).

[2] U. S. Patent 1,279,379.
[3] U. S. Patent 1,557,358.
[4] U. S. Patent 1,625,207.
[5] U. S. Patent 8940, issued to J. B. Horne and J. R. Horne.

Before the first World War, an early project of the National Canners Association involved a study of food packed in tin containers. One of the workers who became deeply interested in this type of investigation was Thomas Rector, at that time with the American Can Company. In other studies, he observed that the head space above paint, packed in cans for some time, was filled with nitrogen. The oxygen in the air had been absorbed by the paint oils, which thus became oxidized. From this observation, Rector conceived the idea that oils and fats in food products might also react with the oxygen in the head space of cans, with resulting deterioration. With the help of D. Tenny, Rector developed the process called "Vitapack"[6] in which air was exhausted from filled containers and replaced with an inert gas such as carbon dioxide. At that time, Rector and Tenny claimed that this process largely prevented metallic oxidation and that the carbon dioxide inhibited the growth of molds and bacteria; the latter idea proved erroneous after further experimentation.

Rector improved the process for vacuum packing coffee in tin, and in the early 30's developed the "Vitafresh"[7] method which removed 99 per cent of the air instead of the 90 per cent possible under previous methods. This system provided the maximum preservative treatment for ground coffee that has thus far been developed. By increasing the speed with which the coffee can be packed after grinding, the desirable freshness and flavor of the coffee is retained. The National Tea Co. began to market coffee vacuum-packed in glass about the same time (1934). This step was made possible by the invention of the slotted screw cap in which the blade of a knife can be inserted for easy removal and subsequent resealing, thus making possible high vacuum in glass. The Vacu-Vent[8] cap brought out by the Armstrong Corp. in 1935 is a closure designed to hold a vacuum as high as 27 in. (mercury). This type of closure consists of a screw cap with a corrugated diaphragm top having an automatic valve in the middle of the cap. Up to the present time, it has never been widely used.

Gas packing

Gas packing of food, in which a can filled with the product is vacuumized and the vacuum relieved with carbon dioxide or other suitable gas, first appeared as a patented process in 1860.[9] At that early date, the causes of food spoilage were not known, but from patents issued to Francis Stabler,[10] it would appear that this inventor had an idea that oxygen was in some way responsible for the development of off flavors in foods. So far as can be ascertained, shredded coconut was the first product actually gas packed on a commercial scale. The first machinery set up for this pack in 1921 represented considerable progress along gas-packing lines. In 1924, the Merrill-Soule Co. marketed the first gas-packed whole milk powder under the trade name of "Klim." This process is covered by patents issued to W. G. Hawley in 1927[11] and to I. S. Merrell and H. Schibsted in 1930.[12] The wide public acceptability of these two products focused the attention of many manufacturers on the process of packing under inert gas.

Inert gas packing was tested experimentally on nuts, coffee, cereals, dried fruits, dehydrated vegetables and similar products with the results that many of them now are packed successfully in this manner. Several mechanical arrangements have been devised for exhausting the air from containers filled with food and relieving the vacuum with an inert gas, usually carbon dioxide or nitrogen. During World War II, gas packing for the protection of dried foodstuffs was widely used for both military supplies and shipments of lend-lease products.

Canning techniques

The particular process used for preserving foods in hermetically sealed containers depends upon the physical condition and storage characteristics of the material. All modern canning procedure attempts to remove from the sealed container the greatest possible amount of air and other gases which may be present in the raw materials. Oxygen is undesirable because it may react with the food during storage and thus impair the quality, flavor, nutritive value or appearance of the product. Other gases sometimes present in the food or produced by cellular respiration may cause serious defects, for which reason they should be excluded in so far as possible.

In the case of coffee which has been packaged immediately after roasting, considerable quantities of carbon dioxide gas may be given off and lead to undue pressures within the container, which may cause deformation when tin is used. Blanching of raw fruits and vegetables is employed mainly for the purpose of inactivating natural enzymes, but at the same time may drive off some of the gases present. Preheating or exhausting is relied upon to get rid of the bulk of the gases present in the raw food and to exclude air from the container. "Exhausting" is the term applied to an operation used in wet packing in which an open container of raw food is passed through an exhaust box in which hot water or steam is used to expand the food by heat, thus driving off air and other gases present in the food and in the head space of the container. The time and temperature treatment varies with the product. After exhausting, the can is hermetically sealed, heat-processed and cooled, the latter step developing a partial vacuum. Alternatively, the food product may be preheated and filled into the containers while hot,

[6] *The Vitapack Process* (Canning Age, 1923).

[7] Thomas M. Rector, "Invention and Engineering Overcome High-Vacuum Pack Problems," *Food Industries*, III, No. 8 (August, 1931), p. 328.

[8] "Closures; Adaptation to Vacuum Packing Marks Five Year Progress," *Food Industries*, VII, No. 3 (March, 1935), p. 120.

[9] U. S. Patent 28,424 issued to Twing and Woop.

[10] U. S. Patent 50,965.

[11] U. S. Patent 1,637,311.

[12] U. S. Patent 1,786,858.

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followed by immediate sealing. Still another technique is to pack the food in the container and then add a boiling sirup or brine. A special machine has been developed, designed to seal cans during a continuous operation in which gases and air are withdrawn by applying a high vacuum to the can. This process is termed "vacuum packing" or "Geraldizing" after F. F. Fitzgerald,[13] originator of the process. The value of this method for the retention of vitamin C in evaporated milk has been recently demonstrated by Doan and Josephson.[14]

The three accepted techniques for vacuum canning in use today are described in the following paragraphs. All of these methods result in a very marked reduction of the residual oxygen content.

Hot water exhaust method—Used mostly for fruits, this is a process in which filled cans are carried through a tank of water thermostatically controlled to 180–190 deg. F., the water level being within one inch of the top of the cans. The time cycle is approximately six minutes.

Direct steam exhaust method—More rapid than the hot water method (30–60 sec.), this is used primarily for vegetables. The cans are carried through a box in either a straight line or a winding path, while live steam from jets impinges upon the sides and tops of the moving cans.

Mechanical vacuum sealing—Used for meat and fish. First, the can cover is lightly clinched on by machinery. Next the can is moved into an exhaust box where live steam is used to drive out the air. The sealing is completed directly as the cans emerge from the exhaust box. The time cycle for this process generally consumes from 15 to 20 minutes.

The value of vacuum packing

When food products which are relatively dry are packed in sealed containers, the storage life of the material can be greatly prolonged if the amount of oxygen remaining in the can is reduced to a minimum. Products containing fats eventually develop rancidity in the presence of air, as a result of oxidation. Among the variables affecting the rate of rancidity development, the concentration of oxygen within the container is probably most important. Exposure to light, increased moisture and elevated temperature of storage are other contributing factors which increase the deterioration, but they are more susceptible to control. Another type of change traceable largely to oxygen is alteration in flavor, such as staleness or destruction of delicate aromatic compounds. Oxygen usually affects the color of foods adversely and accelerates destruction in vitamins A and C. While insects or their eggs have no place in foodstuffs, dry powders are a favorite habitat for the confused flour beetle. A sufficient reduction in the oxygen content of a container will kill such insects in all stages. The combination of low-oxygen content with a mold inhibitor prevents the growth of molds in food substances which are low in moisture. Some dry foods really contain considerable moisture which can cause corrosion of tin. Low oxygen content is an effective retardant of such corrosion.

The percentage of oxygen which can be removed depends entirely upon the specific requirements for a particular product. While materials containing fat should have an atmosphere as low in oxygen as possible, most dry products will store well when two per cent less oxygen is present.[15] For vacuums which will produce such low oxygen content, glass containers are preferable to tin, since glass has the strength of wall necessary to resist deformation resulting from shocks occurring in handling. This objection to the use of tin can be overcome if the vacuum created is relieved by an atmosphere of inert gas. Vacuum packing is a convenient, inexpensive, high-speed method of closing containers with a moderately low residual oxygen content. It offers certain merchandising advantages because of the vast amount of money which has been spent in advertising the benefits derived from vacuum packing.

Advantages of gas packing

The two gases commonly used for gassing foodstuffs are carbon dioxide and nitrogen. Each offers certain advantages and may be purchased in convenient high-pressure cylinders. In addition to being the cheaper, carbon dioxide usually has a lower oxygen content. However, it is soluble in most fats and oils so that foods containing fats when packed with carbon dioxide develop a vacuum within the container. This adsorption of carbon dioxide may lead to flavor changes which can be good or bad. A combination of nitrogen and carbon dioxide is sometimes used with such products to prevent building up too high a vacuum inside the can. An inexpensive inert gas which is obtained by burning the oxygen out of the air, usually with illuminating gas, to produce a mixture of carbon dioxide and nitrogen has been used satisfactorily.

Various methods have been devised for eliminating the use of preliminary evacuation for liquid or semi-liquid products. A flushing method is commonly used in which the head space within the container is flushed with inert gas as the cover is being assembled. It has been used with success on beer, fruit juices and shortening, which can thus be packed with present-day equipment with residual oxygen content of two per cent or less in the head space.

For dry products, a purging method is used, in which a regulated flow of gas is introduced at the bottom of the container. When the air has been flushed out, the cover is dropped on the container and sealed. An inherent difficulty of this technique is the determination as to when the gassing is complete. One rarely obtains

[13] American Can Company, Research Department, *The Canned Food Reference Manual*, 2d ed. (New York: American Can Company, 1943).

[14] F. J. Doan and D. V. Josephson, "Vacuum Sealing Will Retain Vitamin C in Evaporated Milk," *Food Industries*, XVI, No. 5 (May, 1944), p. 91.

[15] Roger V. Wilson, "Take Oxygen Out of Cans to Improve Flavor and Quality," *Food Industries*, XVII, No. 8 (August, 1945), p. 78.

a residual oxygen content below four per cent by this method. Solid carbon dioxide has been used, one patent by Hansen[16] utilizing this idea in combination with a standard vacuum sealer. During the war, one of the Government laboratories devised a flushing method with solid carbon dioxide, used primarily for 5-gal. packages of dehydrated vegetables. With this technique ground dry ice is placed in the bottom of the can, the product is filled in and the cover is placed loosely on the top. The can is conveyed through a water bath or other device for melting and vaporizing the carbon dioxide. When the air in the can has been displaced the cover is sealed. This process is open to the same objections as the other flushing methods.

The most common method used is a combination of vacuumizing and gassing, very similar to that originally outlined by Stabler[17] in 1856. Variations in procedure have been based on differences in the speed desired, the degree of vacuum needed and the purity of gas available. The batch method has been generally used, the vacuumizing and gassing being carried out in a gassing box or chamber. The covers are either loosely clinched on the can or punctured with a small hole. Upon completion of the vacuumizing and gassing operation, a tray containing the cans is removed from the box and the cans are either sealed or soldered as the can may require. Usually a positive charge of 2-lb. pressure of gas is used to retard the re-entrance of air into the cans during the sealing. In the automatic method developed just before the last war, a rotary machine fitted with many gassing bells was used. In this machine, the filled cans were automatically handled through the clincher, the gassing chamber and, finally, through the sealing machine.

Packaging under gas makes it possible to reduce the oxygen content in containers below two per cent. This is essential for coffee, nuts, crackers, cookies, wheat germ, whole milk powder, dried whole eggs, dehydrated carrots and cabbage. Many other dehydrated products such as candies, potato chips, gelatin desserts, corn meal and allied foods will profit by packaging under residual oxygen of less than five per cent. For some foods, a partial reduction in the oxygen content of the container will prove advantageous. A recent study[18] as to the value of inert gas packaging for various dehydrated foods concludes that gas packaging lengthens the life of such products considerably and preserves their flavor without destroying the vitamin content of the given product.

Flexible packages

Government orders during the war restricting the use of tin and glass for packaging consumer items stimulated research on the use of flexible materials for packaging foodstuffs. Many ingenious adaptations of laminated films of metal, cellophane, synthetic plastics and/or chlorinated rubber were devised. Some of these afford excellent protection to foodstuffs against water-vapor transmission. Efforts to make them gas- or air-tight have so far been less successful. Vinylidene chloride (Saran) film, while used mostly as a package for moisture protection during the war, presents definite possibilities as a flexible packaging material for gas-packaging food products. Chlorinated rubber (Pliofilm) proved very valuable as a moisture barrier in wartime uses, but can scarcely be considered gasproof. Recently, Woodcock[19] has reported a flexible cellulose material consisting of wax-coated laminated cellophane films which has been shown to transmit carbon dioxide differentially at a rate 25 times that at which it transmits oxygen. Packages made with this film were gas packaged with carbon dioxide and developed a vacuum on standing. Transmission of oxygen was slow, the package being reported effective over a period of six months. Isherwood and Macara[20] in England were successful in developing a nonmetallic container which makes a gas-tight package for dehydrated foods. Various films which were only slightly permeable to oxygen and were moistureproof became the center of attention. Such flexible packages were filled with pure nitrogen and sealed. After 7–10 days storage to detect leakers, the good packages were completely dipped in a warm, aqueous solution of gelatin and glycerol. Dropping tests at various temperatures and humidities were tried, the results indicating that not only was the surface impermeable to melted fat but to most fat-soluble taints as well. Recent reports indicate that this package is not standing up well and that the cost is so excessive as to preclude popular usage.

Conclusion

For wet canning, the vacuum method of packing helps to prevent deterioration of the food product. It is simple, effective, economical and can be used to preserve food in almost any size container.

For foodstuffs with low moisture content, vacuum packing or gas packing offers definite advantages because of the reduction in oxygen content within the container. The use of inert gas is generally preferable since the pressure on the walls of the container is equalized by gas just before sealing. This relieves the strain on the container and thereby lessens the possibility of leakage.

Gas packing is preferable to vacuum packing for finely ground or powdered material. The advances in gas packing made during the war predict wider usage.

Vacuum packaging is also discussed in other articles in this volume: *Vacuum–Gas Packing of Foods in Metal*, p. 329; and *Vacuum Packing in Glass*, p. 390.

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[16] U. S. Patent 1,625,207.

[17] U. S. Patent 50,965.

[18] *Storage Characteristics and Packaging Requirements of Some Dehydrated Fruits and Vegetables* (Continental Can Co., Research Department, 1944).

[19] A. H. Woodcock, "Vacuum Pack with Flexible Cellulose Material," MODERN PACKAGING, XVIII, No. 12 (August, 1945), p. 144.

[20] F. A. Isherwood, "Dehydrated Foods in Non-Metallic Containers, Part I," MODERN PACKAGING, XIX, No. 1 (September, 1945), p. 137. T. J. R. Macara, "Dehydrated Foods in Non-Metallic Containers, Part II," *Ibid.*, XIX, No. 2 (October, 1945), p. 162.

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Production considerations

by H. F. Brownell

War proved that special packaging protection is needed to ensure proper delivery of merchandise to various parts of the world, and steps will have to be taken by many manufacturers to provide the material and equipment to furnish such protection.

One of the main functions of the War Production Board was to promote simplicity. Regulations were issued to reduce the number of bottle designs. Not only has this resulted in a greater production of bottles by the glass industry, but it has reacted to the best interests of the packager of those bottles by making simpler filling, capping, labeling, cartoning and packing operations. The production man wants those fundamentals to remain, since they permit the production of more packages for less money.

The appearance of a package must not be permitted to interfere with practical or economic functions.

The primary consideration, of course, is whether or not the container selected will move along the various conveyors without jamming or tipping over. Will it go through the machine to receive its charge of the product? Packagers who are able to secure containers having the same shape as those which they formerly used are indeed fortunate; their machinery is equipped to handle the packages. Sometimes the new container is not acceptable for the machine without alteration or rebuilding of parts. Many packers are, therefore, unwilling to accept a new package which necessitates changes in their machinery.

A new package usually incorporates a new cover or closure which can seldom be used without changes in the mechanism used for applying the closure. This frequently means that closing operations will have to be performed by hand. Still further along the production line, the label must be attached—if it has not previously been affixed by the container manufacturer.

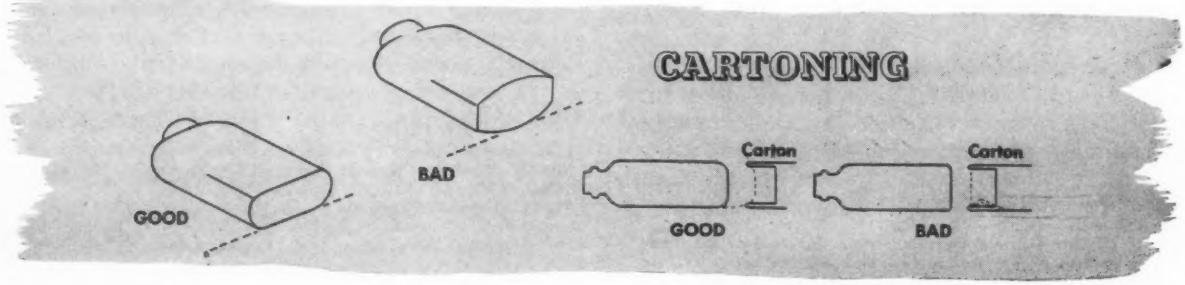
Floor space can be conserved by the selection of collapsible boxes rather than boxes of the set-up type, and telescope containers also occupy less room than others. In some industries, containers, packing materials, corrugated cases, etc., are each purchased from different concerns, requiring multiple storage space, while in other industries, such as the bottle industry, one source of supply provides the entire required unit, which is a preferable condition.

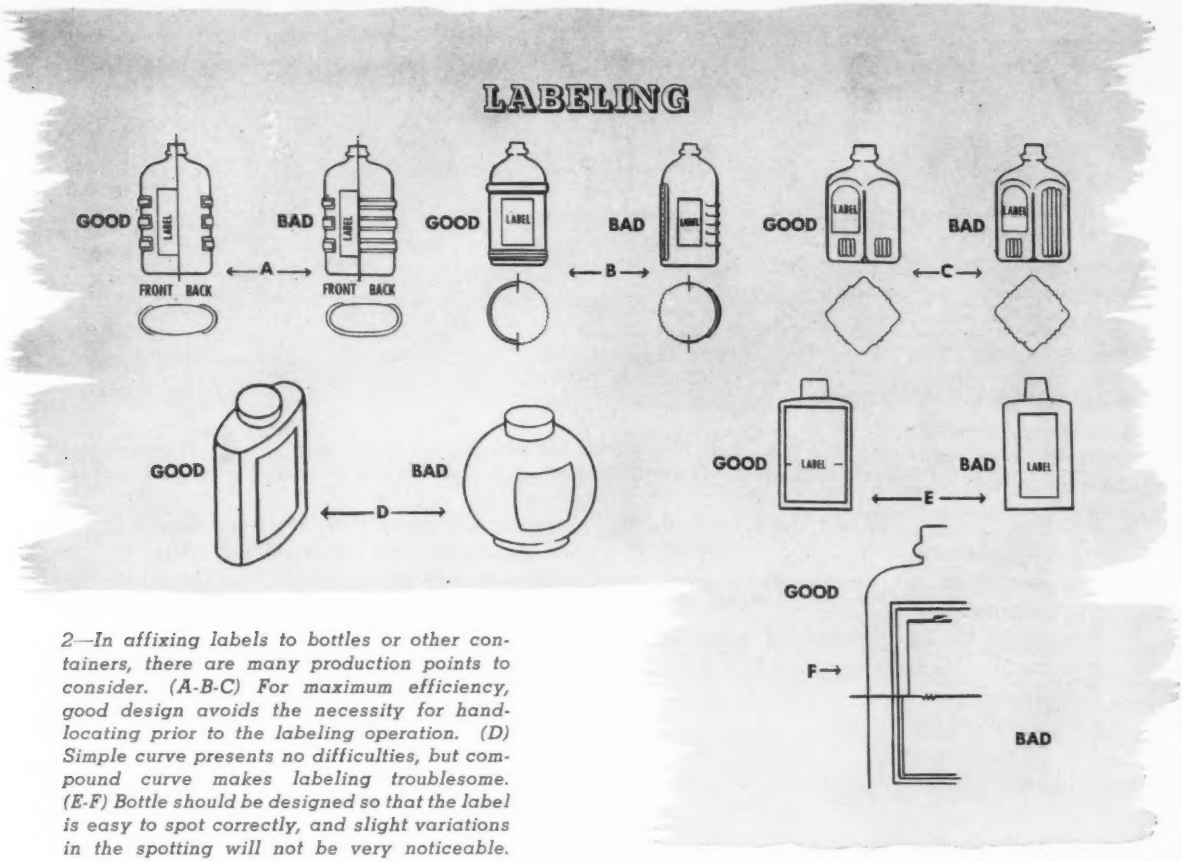
It is the job of the packaging engineer to consider and weigh all factors so that he may choose a package which, after meeting the requirements of the contents, will meet production requirements necessitating the fewest adjustments.

The chief objects of production are:

1. To assemble in the most efficient manner—
   a) Space is at a premium in most factories and a package should be produced in the least possible amount of floor space.
   b) Any good production man wants the production of as many units as possible per hour.
   c) All supplies should be immediately available.
   d) Supplies should be on the same floor with the assembly or accessible with little handling.
   e) Every production man's dream is straight-line production. Production can be in L-shape or U-shape and still be straight-line so long as breaks or bottlenecks are avoided.
2. To produce at the lowest possible cost—
   a) The assembly of a particular package with the least possible amount of labor.
   b) Waste should be reduced to the minimum.
   c) Just as important as an even flow of raw material to the packaging lines is the smooth disposal of finished goods from that line.
3. To anticipate future handling of the package—
   a) One never knows just what the result in sales will be when a familiar package is changed or replaced by a new one. The production man tries to think of what would be necessary should the conditions change.

1—Bottle design principles: (Left) For cartoning purposes, flat side is most desirable. (Right) Ample radius at the base of the container permits it to slide easily, smoothly and quickly past edge of the carton.





2—In affixing labels to bottles or other containers, there are many production points to consider. (A-B-C) For maximum efficiency, good design avoids the necessity for hand-locating prior to the labeling operation. (D) Simple curve presents no difficulties, but compound curve makes labeling troublesome. (E-F) Bottle should be designed so that the label is easy to spot correctly, and slight variations in the spotting will not be very noticeable.

Whenever a new package is created and production is being considered, the production man naturally breaks the package down into its component parts and makes a study to see how it will go through his line.

Choice of container—Of all the components of a package, the container represents the starting point. These factors are of primary importance to production:

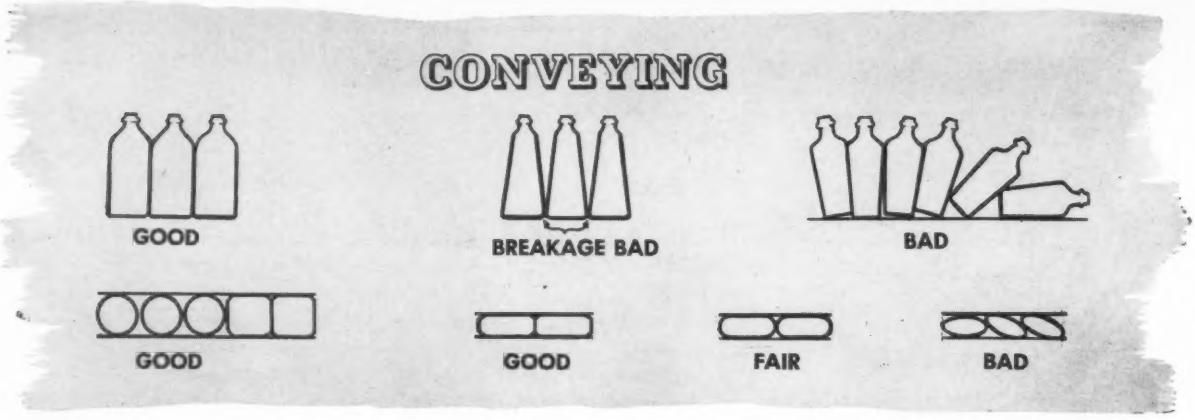
1. No part of the container should be deceptive in appearance.
2. It should be the proper size and shape from the consumer's point of view.
3. It should be of the proper size and shape to move freely along the conveyor.
4. It should not pile up or jam anywhere along the production lines.
5. It should be able to go around curves or be pushed without breaking, chipping or encountering mechanical difficulties.
6. The opening should be large enough for filling.
7. The opening should be convenient for removal of the contents.
8. It should have the proper label space.
9. It should be constructed sturdily to withstand traffic conditions and be free from breakable parts.
10. It should have no feature which would prevent assembly by a fully automatic machine.

Choice of label—When a production man sees a label, he studies it carefully in its relation to the rest of the package and with the following points in mind:

1. To avoid oddly shaped or freakish labels.
2. The label should fit properly into the label space.
3. The back of the label should be of such quality that it will adhere properly to the container.
4. Consideration of a label implies also the adhesive used with it, because the product has to be stored in hot places, cold places, damp places and dry places and it is not unusual for certain types of adhesives to crystallize or become damp, thus allowing the label to come away from the package. The same type cannot be used for a tin can as for glass, a varnished surface or corrugated case.
5. If the contents of the package will deface the label, steps should be taken to have the outer surface coated with varnish or lacquer.
6. It must be possible to apply labels by machinery.

Choice of closure—The following requirements are considered by a production man:

1. The closure should fit the container properly.
2. It should make a tight seal, effective over a long period of time.
3. The resealing features should be satisfactory from the consumer point of view.



3—Designs for conveying: Top row: (Left) Non-tipping bottles; (Center) Single point of contact causes breakage; (Right) This design causes tipping. (Bottom) Oval shapes turn and wedge, rectangulars and rounds do not.

4. The liner should be of such quality as to withstand deterioration.
5. The liner should not contaminate the product in the container.
6. Scarcity of tin has necessitated regulations to conserve it. Many lacquers are available. One should be chosen which will not be affected by the contents of the package.
7. There should be no feature of the closure which would prevent its being applied and tightened by the usual type of closure machine.

Choice of carton and wrapping material—The following details must be carefully worked out:

1. The carton itself should not be deceptive in size but should fit the container it holds.
2. The carton should be sufficiently heavy to withstand abuse in traffic.
3. All details of construction of the carton should be such that it can be run on the available cartoning machines.
4. The package should be of proper shape and construction to permit wrapping by machinery.
5. Wrapping material should be of the correct type and weight for the purpose.
6. The right type of adhesive or sealing mechanism should be available for the wrapping material.

Choice of packing material—In choosing materials:

1. Packing materials should be selected of the proper quality and type to protect the package.
2. The finished package should comply with all Interstate Commerce Commission regulations.

When considering a new package, the production man must visualize the assembly in the factory, giving close attention to the machinery involved.

If there are any lines of machinery which are not employed to their full capacity, the details of construction of this new package should, if possible, be adjusted to the use of this line of equipment.

Practically all sales start small and then expand—sometimes very rapidly—so when the machinery is being considered for the production of any package, it is important to get some idea from the sales department as to future requirements. If there are certain periods of the year when the package may have greater sales than at other times, they will call for peak production.

The purchase of additional machinery should be considered on the following two points:

1. Tools and equipment are absolutely required to produce some articles of commerce. The greater speed of production obtained from machines is necessary to meet the sales demand. The manufacture of many items would progress very slowly if the operations were done by hand.
2. Considering factory costs—that is, how much will be saved—studies should be made to determine the output of a machine. Management should know the exact cost of making each unit or thousand units by hand and then, if the volume is sufficiently large, it is in a position to state whether the expense of buying the equipment will be offset by labor savings.

Many new plastics have been developed. Containers of plastic are entering the picture. New types or forms of closure are on the market. Adjuncts to the package are available. New types of bag and bag-filling equipment may be obtained. Some types of machinery used in the manufacture and assembly of war material will find a place in the production of peacetime commodities. Both the designer of new packages and the production man have to find practical ways of selecting those things which will adapt themselves to machinery production.

Manufacturers of packaging machinery are now making equipment which was shut down because of the war. In some cases the packager considers the substitute package superior to the original. It is his duty now to study the situation and make a decision before ordering new equipment or additional parts for the old machinery.

The role of the designer

Many business men do not understand just what goes on behind the studio doors. For this reason, the editors of MODEN PACKAGING ENCYCLOPEDIA asked a panel of successful designers[1] to list their services and methods of operation. The surprising degree of uniformity in their answers, from which this article has been compiled, reveals that, in general, the designer's procedure may be broken down into seven steps:

1. Preparatory work and study
2. Analysis of the information gleaned in Step 1
3. Specific study of the client's product and marketing problems
4. Preliminary sketches leading up to the final sketch
5. Presenting the final sketch and reconciling differences of opinion
6. Making of working drawings
7. Cooperation with suppliers for the reproduction of designs

Responsibility of the designer

The extent of the designer's contribution to a finished package will depend upon two factors: 1) the size and degree of development of the manufacturer's packaging department and 2) the versatility and size of the designer's staff. If the former is large and the latter small only a satisfactory preliminary sketch and a good working drawing may be needed; if the reverse is true, the designer may undertake the entire development of the package from start to finish. Furthermore, he may round out his plan by designing the shipping container, display pieces, etc.—and his organization may even be prepared to suggest new recipes for food products. Some designers—Egmont Arens, for instance—not only design packages for the product manufacturer or chain store owner but also suggest potential packaging uses to the materials manufacturer.

Many of the designers have stressed those aspects of their work which include the functions of market researcher (see p. 34) and the manufacturer's packaging department (p. 37). Designers who stick to design alone, however, can contribute to the other aspects of package development. Jim Nash states the latter case: "Most of our clients have production or plant managers who, with the help of their research departments, develop a practical package to protect the product and specify the sizes needed to satisfy their market. If the client has no production manager, we recommend that he contact package machinery companies and package material suppliers for advice in developing a practical, economical package. Our experience with other products frequently helps us to direct these clients in the proper channels, but we do not undertake to interview the package machinery suppliers or the package material suppliers."

The designer as he sees himself

Though the designer's job is, in many ways, becoming standard, his concept of what his contribution should be and his attitude toward his clients vary. Designers with diametrically opposite attitudes have been completely successful and so have those whose philosophies lie between the extremes. We quote from some of them.

Lucian Bernhard: "The package designer is an artist who makes your product be seen and conquer. . .Like a cook, he can do a better job if the importance of his work is appreciated, if he is unhampered by clients' preconceived notions due to familiarity and interest in the details of the product. . .Remember that you don't tell your doctor what to prescribe for you—don't tell a good package designer how to design your package."

E. Leonard Koppel: "We emphasize utter objectivity during all conferences with the client. This is an important feature in the successful designing of a package that is often overlooked. A proper basis of understanding between client and designer lays the groundwork on which both may work . . . Although I may not personally like a particular color, shape or theory of design, if it is my belief that any or all of these are right for the product, I am going to use them. And I want my client to disregard personal dislikes or prejudices . . . I always encourage and accept constructive criticism."

John Vassos: "Manufacturers know that it does not cost any more to make a good looking package than it does to make an ugly one. They have accepted the designer as a necessary and important cog in industry, but both packaging and industrial designers will lose the ground they have gained unless they contribute honest and sensible solutions to the manufacturer's problems and give the values that are so necessary to our aesthetic expression."

John E. Alcott: "A package is not an end in itself. It is merely an adjunct in merchandising the product."

[1] The following designers and design studios have contributed ideas which appear in this article:

John E. Alcott	Lea Tek Studios
Egmont Arens	Mildred C. Lucas
Lucian Bernhard	Eugene Lux
Alan Berni	Margery Markley
Charles Cruze	Jim Nash
Charles C. S. Dean	William O'Neil
Frank Gianninoto	George Sakier
Frances Cushing Hall	Jon Stengren
G. McStay Jackson	Martin Ullman
Howard Ketcham	Van Doren, Nowland & Schladermundt
Koodin-Lapow Associates	John Vassos
E. Leonard Koppel	Leonard Wheeler
George R. Kraber	Georges Wilmet
	Emmy Zweybruck

Frances Cushing Hall: "Many clients have personal prejudices which the designer cannot understand but which should be considered."

Martin Ullman: "I believe the designer must be absolutely honest in his approach to a problem, and to his client. He must be unbiased as to sources of material, types of material and fabricators. He must become a cooperating part of the business which engages his services, and must get every fact about the product before he attempts creation of any new package. Having created a new package, the designer should personally follow its production through the plants of material supplier and fabricator, to ensure uniformity of quality in the finished package. Above all, I believe the future of packaging lies in evolution rather than revolution."

Leonard Wheeler: "Because most package designers started as artists, they are more concerned with outward appearance than with the less glamourous fundamentals of packaging. They decorate their packages beautifully, then compromise their designs to fit whatever the material suppliers can provide. The result is usually a quick demise for what would be an otherwise attractive container."

Emmy Zweybruck: "I believe that the most satisfactory practice is to have one artist design the whole line. The artist's ideas and style can only be carried out by repetition. One item among ten other brands can never present competition, whereas ten items, all designed by the same person, are sure to be noticed."

Preparatory studies

"What do you need, and why?" Before starting a package design, Jon Stengren likes to eye a product squarely and ask these questions.

Usually, the designer's first step is some sort of research into the marketing aspects of the product and a study of the good and bad points of the old package. This may include a full-dress field survey, or the research may merely comprise, as Eugene Lux archly states, having enough knowledge not to design a package for sausages which looks like one for cosmetics, or a hardware package which looks like one intended to contain chocolates.

Before he touches his drawing board, the design specialist will also want to know, either through his own research or through data furnished to him, about the protective requirements of the package, the client's production line problems and something of the history of the product after it leaves the packaging line. He may, as John E. Alcott does, have a highly developed checklist of questions which must be answered before the work of design begins. The Alcott list includes, firstly, an analysis of the product, its competition, its sales appeal, its size; secondly, a determination of the function of the package; and finally, a determination of the product's packaging requirements which will best meet and satisfy all of the needs of consumer, retailer and manufacturer.

Getting acquainted with the client and his plant (apparently in shirt-sleeves, if possible) seems to be an important preliminary. Ben Koodin's program for this is typical. He suggests first a round-table discussion with key executives and department personnel to clarify controversial points and crystallize vital problems. Next comes a plant survey following the product through production assembly, packaging and shipping to determine possible limitations and potential opportunities for the package.

In rubbing elbows with the client, the designer should determine, as Mildred Lucas[2] points out, whether or not the new package is to be his special "baby." If it is merely an addition to a well-established line, it should incorporate all that is good in the related packages. But if it is to be new, and heavily promoted, it should reflect some of the client's own ideas, and his aesthetic tastes, particularly those in regard to color, should always be considered.

The manufacturer's advertising department may have a great deal to do with the package design. A study of past advertising furnishes many useful clues to the designer. The advertising department may require, as Charles Cruze suggests, that the package design look well when reproduced in a single color in newspaper advertisements and also that it look well in the dealer's window.

Whether or not a radical design innovation may be attempted will depend to a large extent upon the advertising budget. Eugene Lux cites a successful package which was similar to a heavily advertised competing line, and another successful line which was completely different from anything seen in the trade before.

Package ingredients

Once he knows what he is packaging and in what type of container, the average designer, before making his preliminary sketches, will decide upon the visual functions of each element of his package. Lucien Bernhard analyzes them for us: "Color, lettering, lay-out and illustration. Every package, from nuts to washing machines, makes use of at least the first three ingredients. Sets of rules and charts even exist on how to mix them. However, as the best food is cooked not just from a cook book but by an expert chef, so the best package is created not by rules alone but, by an expert designer."

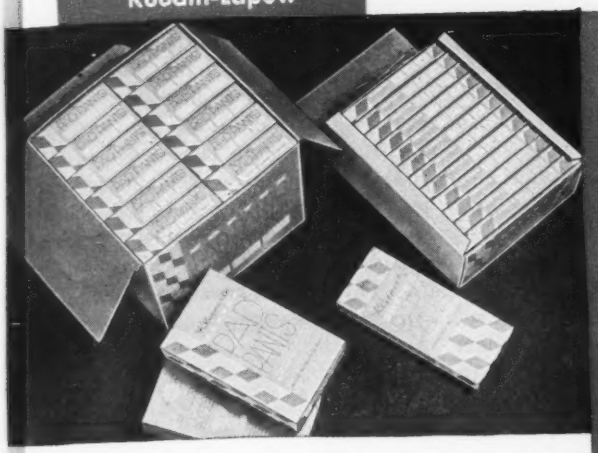
Most designers agree upon the importance of these basic elements mentioned above but, from there on, they are apt to differ widely.

The trade-mark is another important package ingredient. If an entire line of new packages is being created, Charles Dean suggests a trade-mark, trade device or some design treatment which will act as the theme for the whole line.

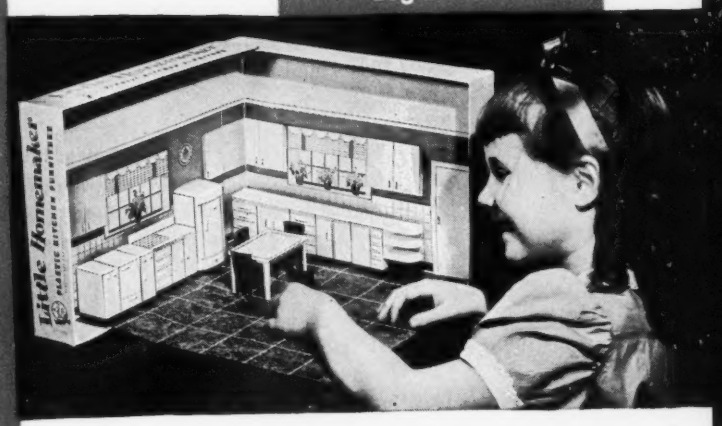
Alan Berni suggests that the "atmosphere" is one of the more important elements in package design. One manufacturer may see his product as having a strong element of elegance; another may prefer to use a more

[2] See special bread wrap designed by Mildred Lucas and illustrated on p. 646.

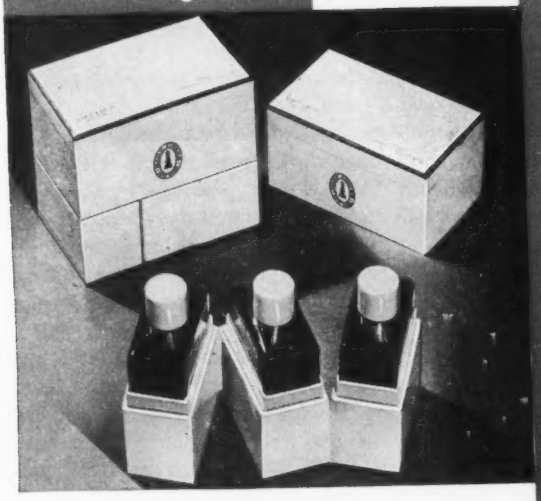
Koodin-Lapow



Eugene Lux



Jon Stengren



Charles Cruze



Jim Nash



Egmont Arens



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colorful, more robust approach. This attitude of the manufacturer should be reflected in the package, blended with elements which will encourage the prospective customer to buy. For example, sand soap will be impractical in a pastel cardboard container and face powder in an unglamourous khaki tin can would be even more of a failure.

Related to the "atmosphere" element is what G. McStay Jackson calls the "shock value" and the "repeat value" of the package. The usual elements of form, color and texture all have their place here, but a major ingredient for a package which will have "shock" value is a product name which will be adaptable to visual representation on the package. If the product name has not yet been chosen, the Jackson studio likes to help the client make his ultimate decision with this factor in mind.

In contrast to the "shock value" theory is Georges Wilmet's firm belief that all elements of design should be classical with no emphasis upon novelty appeal, regardless of the product. He feels that a good package design is one which should sell the product over a period of at least ten years and he never uses anything which hasn't proved the test of time. In his estimation, a good package should, at a glance, identify the product and the maker's name, reflect quality and inspire confidence in the maker. Nevertheless, this designer feels that sales appeal should never be forgotten. For example, though he believes that all drug packages should be "ethical" in appearance, drugs intended for popular consumption, like vitamins, must come in containers keyed to popular consumer demand.

The sketches

The designer's procedure in evolving and presenting his design is up to him and the answers on this score are as varied as the Artistic Temperament and the Industrial Mind. Sometimes the preliminary sketch is not made until *after* all physical and visual requirements have been carefully analyzed; sometimes it is made before such an analysis and is then adapted to the requirements of the product. One designer may dash off a rough sketch, submit it to the client for his reaction and then try again and again until a final design is agreed upon. Another may show the client a single design and say: "Here is your package, this is how it should be."

Several designers observed that the number of preliminaries shown to the client might well depend upon the client himself. Some clients may be reluctant to approve anything till they have seen a "lot of ideas." As a letter from the Lea Tek Studios observes: "For his money he may want to bet the field, combine ideas that are presented and finally arrive at the 'master package.' The extent of this work is up to the designer and his ability to construct or stage the customer's reactions."

Sometimes the designer will test the preliminary design before submitting it—and the degree and method of testing, too, runs the gamut. Howard Ketcham, for example, will make a series of trial designs and color schemes based upon the merit factors revealed in market tests of competitive packages. When a design is developed which consumer tests prove to be more acceptable than competitive packages, it is *then* adapted to the client's particular needs and price limitations.

The method employed by the firm of Van Doren, Nowland & Schladermundt is to make many preliminary drawings, developing the most feasible in finished form with paper models. "The package is then tested for distance visibility and legibility. The effect in stack displays is determined. The carton is given a rigid shipping test. A small group of consumers is asked to express an opinion. Finally, the design, complete with working drawings and backed up by analysis and testing, is turned over to the client."

Before a design is finally approved, the designer may present it to the client together with competitive packages. Lea Tek follows this practice of "bringing the store to the studio" by setting up dummies of the new designs on shelves containing the packages of the client's principal competitors. The client is urged to make his own arrangement of both packages and lighting to see how the projected design measures up in competition under all circumstances.

Some designers feel, as does George Sakier, that there should be many rough sketches, all discussed at length with the client. "At this point, the highly critical and highly expectant audience will react more violently and directly than at any later time. The experienced designer will quickly recognize which is dead material and which has real vitality—which is pertinent and which is irrelevant.

"The designer will then be definitely oriented, and often the client, too, is able to better clarify in his own mind his needs. By showing that he is resilient and not thin-skinned and that he welcomes the bluntest criticism but has the right to make sure that this criticism is not emotional or prejudiced, he will establish a sound working basis."

In contrast to this point of view is that of the designers who believe that if their preliminary study of the product and the market has been thorough, the first sketch is bound to ring the bell. William O'Neil presents this sketch together with one or two evolutionary roughs.

"If the design is basically right according to preliminary studies," he states, "it will 'belong'—and I don't care how many changes, revises, or new ideas are injected into the picture by the stenographer, assistant to the president or packaging committee. They will always return to the first sketch. . .Final sketches, therefore, are 90 per cent passed by all committees."

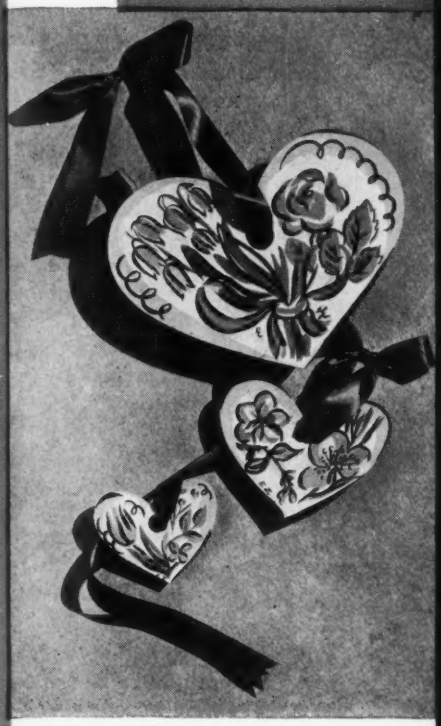
Similarly, Frank Gianninoto writes: "Preliminary steps are based on a study of estimated requirements and are discussed with the client. Basic directives and specifications are stipulated to ensure that the final product be in accord with the thinking of the client and our own organization. As a result, the final sketches leave only minor points to be adjusted."

As a "preliminary" sketch, Jim Nash shows his client

Charles C. S. Dean



Emmy Zweybruck



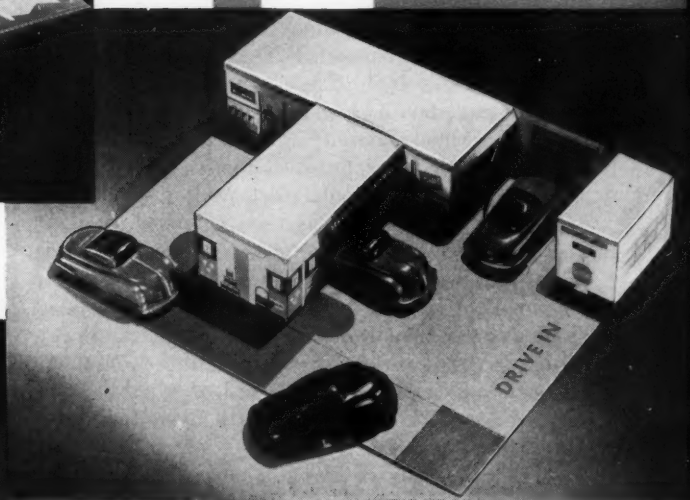
Georges Wilmet



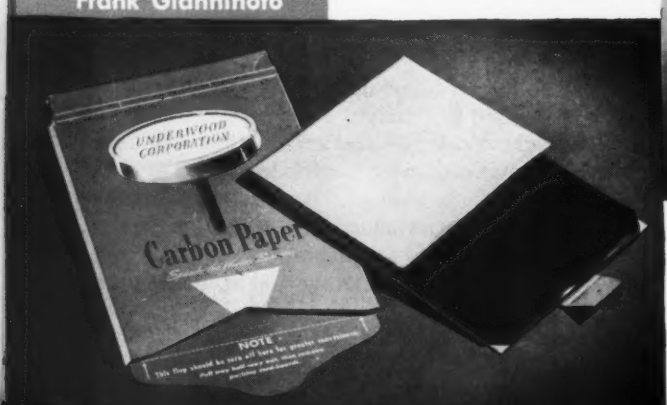
Martin Ullman



Alan Berni



Frank Gianninoto



a full-color drawing, the actual size and shape of the finished package. This sketch incorporates the designer's recommendations for solution of the sales problems, advertising objectives and production problems. "The colored sketch," writes Mr. Nash, "is usually a complete presentation having the final appearance of the package. It can be used for sales meetings and tested in stores for visibility and shelf value against competition. It can be used for legal approval or to get estimates from producers or as a guide for the advertising agency. In other words, it leaves nothing to the imagination. We seldom submit more than one design. If our preliminary study has been thorough and correct, the changes are never serious."

On the subject of the preliminary sketch, designer Mildred Lucas cautions that it "may be packed with dynamite if shown to a client in its raw state. While the artist has in the back of his mind all the necessary mechanics, he approaches this first sketch with a creative freedom which very often results in a brilliant and handsome package which, if seen in its unhampered state by the client, may very well become his yardstick for the final design. When the artist refines the design and injects all the elements necessary for reproducing it, it may well be too far a cry from the preliminary and too disappointing to the client."

The final sketch

Regardless of whether the manufacturer first sees his new package in the form of a finished drawing or whether he has watched its evolution from a preliminary "rough," the designer has put in a great deal of work before the climactic meeting at which his work is finally approved. At this point, the design generally represents a completely integrated compromise between artist and client. Usually, it is the designer's original idea as modified by the client's criticism.

In form, the final sketch may range from a finished air brush rendering to a detailed dummy package containing the product. If the finished package is to be made of paper, paperboard or wood, the dummy may be presented in the final material; if it is to be made of a plastic, the designer may fabricate a dummy from a similar material, or he may present a plaster of Paris model.

After the final sketch has been approved, designer George Kraber suggests the presentation of isometric cutaway drawings of the package and of its exterior shipping container. These serve a threefold purpose: 1) they enable the client to visualize the package as a whole, 2) they facilitate the assembly of the containers delivered in knock-down form, and 3) they aid the suppliers of inner and outer containers in giving their price estimates.

Working drawings; cooperation with suppliers

Most designers prefer to make their own working drawings and many of them like to stay on the job at least until the package is in the hands of the client.

Alan Berni outlines these steps as follows: "The working drawings are made to exact specifications. The typography on the package is set in an attractive and suitable typeface. Then reproduction proofs are made and put into the correct position on the drawings. The art work is usually made larger than specifications so it will reduce to a clear, sharp cut when the plates are made. In most cases, the designer works at this stage in close cooperation with the suppliers. Die sheets are secured on exact dimensions, or blueprint drawings of specifications may be submitted by the designer to the supplier for execution."

The designer's services

The extent of the designer's final work depends largely upon the specific services offered by his studio. Before turning over the job to the printer, some designers will make whatever drawings or color photographs are necessary, order the engravings, pull color proofs on the stock which is to be used for the finished product and submit the proofs to the client for a final check. Often, too, a design studio equipped to do such work will offer its services to other designers.

Mildred Lucas appraises the designer's cooperation with the suppliers by saying: "In the reproduction of the design, the artist's cooperation with the supplier is part and parcel of his best service. Very often a slight revision can be made in the design by the artist which will enable the supplier to manufacture the package more economically and with better machine precision. By the same token, it is well for the artist to check the supplier so that no liberties are taken with the design which might benefit the supplier but work havoc with the client and the ultimate results."

Ben Koodin concludes: "We have always found that when the suppliers have been given to understand that they have an important contribution to make toward the over-all effectiveness of the packaging program, they are most cooperative and helpful. The outstanding package is the result of close coordination between the triumvirate; the client, designer and supplier. There is room enough for all to take a bow for its success."

From William O'Neil, on the other hand: "The final phase—cooperation with the supplier—is similar to the first hundred miles for the infantry. They certainly make it tough for a designer until they get to know him well enough to give him what he specifies. On this phase alone, the designer earns his full fee in holding out for the results that were projected in the earlier stages."

The designer's job often does not end even when the finished package goes on the client's production line. In spite of the best preliminary testing and consideration in the world, most packages *can* be improved upon. Ideas for better marketing features may come after the package has been introduced. Especially when the designer is retained on an annual basis, as is often the case, it is up to him to follow up the introduction of his package, watch its reception, and to suggest and make necessary changes.

Color in packaging*

by Faber Birren

It may be said that in the styling of consumer merchandise, advertising, packages or displays, the element of design seems to stimulate mental processes in the buyer, while the response to color is largely emotional. While this reaction is not invariable, it is typical of the attitude that most persons assume in spending their money or in being influenced to do so. To understand this is to know why color is a more sensitive thing to handle than is shape or form.

The inherent taste of people for color is frank and unassuming. Of real interest is the fact that only about 18 colors can be named by the average person with any assurance that others will know what he is talking about! And these colors (certainly not by accident) will be found to comprise the best sellers in almost every line of mass market merchandise in existence. They are the hues that will arouse the most attention value and sell the most packages. Here they are: red, orange, yellow, green, blue, violet (or purple), pink, buff (ivory or cream), flesh (or peach), lavender (or orchid), brown, maroon, tan, white, gray, black, gold, silver. While names such as beige, ecru, mauve and the like may be understood by a few elect, they are largely meaningless to the public and generally do not sell well in mass markets. It must be that simple colors, being memorable, are therefore marketable. Odd colors, being forgettable, are risks and speculations.

Color trends of most products move rather slowly and clumsily in mass markets. People at large have definite color preferences; though these preferences may change, they are almost always of an elementary order. The task of styling is to glorify these desires with all possible skill and originality. The art and business of color are on a sound and enlightened basis when the approach is objective and when human wants are carefully analyzed, measured and anticipated. You touch people's emotions—and their capital—when you give expression to their fancies, when you serve their desires and not merely your own.

Many authoritative tests have been made of human color preferences. The results are so uniform that one is hardly able to question the conclusions reached. To summarize the whole picture, H. J. Eysenck tabulated all research involving some 21,060 individual tests. Blue ranked first, then red, green, violet, orange, yellow (Fig. 3).

Here is a further list of research facts that have direct bearing on the problems of selling and influencing people with color:

1. In absolute choice, pure, rich colors are generally preferred to modified ones.
2. The three most preferred hues are blue, red and green; the three least preferred are violet, orange and yellow. These are the so-called maxima and minima—and all intermediate or "mixed" pure hues are not liked so much.
3. However, one blue (or red or green, etc.) is not necessarily equivalent to another in "pleasantness." This means that every region in the spectrum has its best example, which will sell better than its immediate adjacents.
4. Although different backgrounds will affect the visual aspect of colors, this does not seem to have any serious influence on their color-preference rankings.
5. The major interest of people is pure color. This quality is always more dominant than whiteness, blackness or grayness in a color. In fact, modified tints and shades follow the same general order of preference as pure colors.
6. Saturated, or pure, colors, however, appear to be best-liked in small areas. In larger areas a preference is indicated for lighter tints.
7. Colors tend to appear stronger as their areas are increased. Judgments of value or lightness, however, remain fairly constant, regardless of area.

A good deal of research has also been devoted to the beauty of color combinations. J. P. Guilford has offered the best and most practical guidance on this point. To the author's knowledge, Guilford is the first man ever to make a practical and comprehensive study of color harmony in all its variations of tint, shade and tone—a problem that industry is forced to cope with every hour of the day. He has drawn charts to explain the "affective values" of individual hues, and it is very likely that a complete set of these charts will be published in the future. They would prove useful indeed to industry.

Color systems are well worth studying. They give the world of color a semblance of order. They make clear that colors, tints, shades and tones all follow logical sequences and that color organization may be neat and not haphazard. The two best-known color systems are those of Munsell and Ostwald.

Color contrast is particularly useful in packaging. The task of color in packages is to stimulate action on the part of the consumer. Good packages are assured through a practical knowledge of visibility and attention-value in color. For compelling notice, startling the eye, moving a person to action by packaging, it is effective to work deliberately with the spectrum and get it to perform as you see fit.

Red is perhaps the best of signaling colors. It is quick to attract the eye, quick to be recognized and easy to read. Green ranks second for visibility, yellow

* This article is a condensation of a book by Faber Birren: *Selling With Color.* (New York: McGraw-Hill Book Co., Inc., 1945).

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third and white fourth. Blue and purple are both difficult to see and to distinguish.

Yellow is the brightest and most luminous of colors. This accounts for the fact that the most legible of all color combinations is black on yellow. Next in order are green on white, red on white, blue on white, white on blue, with black on white sixth and with the weaker combinations being red on yellow, green on red and red on green. (For legibility, combinations of red and blue are too hopeless to include.)

It must be kept in mind, however, that while white makes a good background, it lacks attention value. There is a difference between ease of seeing and eagerness to see. White may be ideal for a book, but for a package the more exciting fascination of pure color seems demanded.

Red and yellow are the best attention getters, the one being aggressive, the other extremely bright and visible. They hold a never-failing attraction for human eyes and win more glances than any other hue.

Because the focus of the human eye is not the same for all hues, the colors of the spectrum will appear near or far, large or small, in consequence. Red, orange and yellow usually form a sharp and clear image, while blue and violet tend to appear blurred. According to W. Allen Wallis, yellow is seen as the largest of colors, then white, then red, green, blue, with black smallest of all. Bright colors appear large, and warm colors near.

These phenomena have practical application in packages. Bigness is to be accentuated through the use of light, warm colors. Elements in a design meant to stand out with prominence should advisedly be red, orange and yellow—and, preferably, be set off against greenish, bluish or purplish backgrounds of low value; dimension in color increases from coolness to warmth, darkness to brightness and grayness to purity.

One hears copywriters speak of the need for reaching mass audiences with words and phrases geared to the intelligence of young age levels (simple words, not necessarily inane ideas). This is also good policy for color. Too much sophistication, too much artfulness is often missed by simple emotions, just as fancy sentences may be missed by simple brains. Though the primitive and elemental may seem banal at times, it can, with discretion, hurt no one and ring clear in its appeal.

I am reminded of an experience in the design of a peanut butter container. A selection combining hues of pale cream, tan, brown and green was made after months of artistic deduction and a study of consumer reaction. Yet, a later package, designed on good scientific premises (visibility, legibility, etc.) and without the benefit of consumer opinion, greatly outsold the more prized design. This was red, white and blue. High on a shelf, with no one asked to say whether or not it was pleasing, it had the necessary lighthouse qualities to compel attention and set hands to reaching.

Most business executives recognize the importance of color in packaging. In recent years packaging has become a high art; new ideas, new devices have been put to work by almost every organization. The growth of packaged merchandise and of the super market have demonstrated that successful marketing demands not only a quality product at a fair price, but real eye appeal and attention value. Design and color, rightly and strategically handled, help to sell merchandise.

While, perhaps, it is not possible to write ideal specifications for the use of color in packaging—because of the widely different requirements of different products—modern business may benefit from the recitation of several case histories and experiences. Many of the

LABEL SIZE AND THE USE OF COLOR

Dimension against the grain in sixteenths of an inch	Total number of labels	Average number of colors including gold and silver and use of finish
	29	5
17-32	124	5
33-48	190	5
49-64	1200	5
65-80	100	5
81-96	57	5
97-112	3	5
113-128	11	3
129-144	3	3
145-160	6	4
161-176	9	4
177-192	6	4
193-208	7	3
209-224	2	3
225-240	8	3
241 & over		
	TOTAL 1755	5

1—The diagram gives comparative figures in regard to label sizes and colors, compiled as a result of a series of market studies of production of packaging supplies, referred to in footnote No. 1.

following data have been taken from a special survey conducted, with the cooperation of the author, by the Color Research Dept., Eagle Printing Ink Company.

To discuss foods first, a maker of mayonnaise, salad dressing, etc., kept records and charts to measure increased sales as a result of new packaging designs and color combinations. Finding that dark blue and bright red are the outstanding colors, he recently introduced labels incorporating these two hues on white stock. "We have been more successful than we ever imagined; the response was immediate."

The combination of red and blue has also been found most effective by a group of grocery-store chains using private labels.

Red and white (with gold and black) have, by one national canner, been ranked eminently high for both attention and memory value.

A baker reports, "The greatest amount of our goods are sold in the orange or red-orange shades."

As related to foods, several interesting facts have been assembled by Raymond Franzen and Thomas Meloy.[1]

In an analysis of 1755 labels of 120 leading canners, 49.6 per cent were found to use four colors in labels; 37.2 per cent used five colors; 5.1 per cent used six colors; 4.7 per cent used three colors; 2.2 per cent, two colors; and 1.1 per cent used only one impression. In the four-color and five-color labels, red, yellow, blue, black, combined with light blue, constituted the choice of the vast majority. Red and blue were most popular in the two-color labels. The leading combination in three-color labels was red, yellow and blue. In the one-color group, blue ranked highest.

Incidentally, blue-lined containers have been found most effective in selling white eggs, while white-lined containers sell the most brown eggs.

One of America's leading soap manufacturers, who tested consumer reactions to color, writes: "There was not much indication of design preference as long as the basic color was green."

A maker of paste floor wax states that an increase of approximately 25 per cent in sales followed the introduction of a new container using red, yellow and black.

A manufacturer of razor blades who changed his packages from a drab brown to a blue and red color combination writes: "We definitely know that the present color of our package has given us greater display value and has influenced the dealer to place the package on his counter."

It is apparent that research pays and that it will help to eliminate guesswork in the use of color in packaging. Yet, as has been cautioned before, a right and scientific approach may be a better guide to design efforts than is too much leisurely consultation with consumers. The personal viewpoint here is far less vital than a resourceful exploitation of those phenomena encountered in a study of vision.

Red and blue, one a color of high recognition, the other a color of universal appeal, are predominant and rank almost equal in preference.

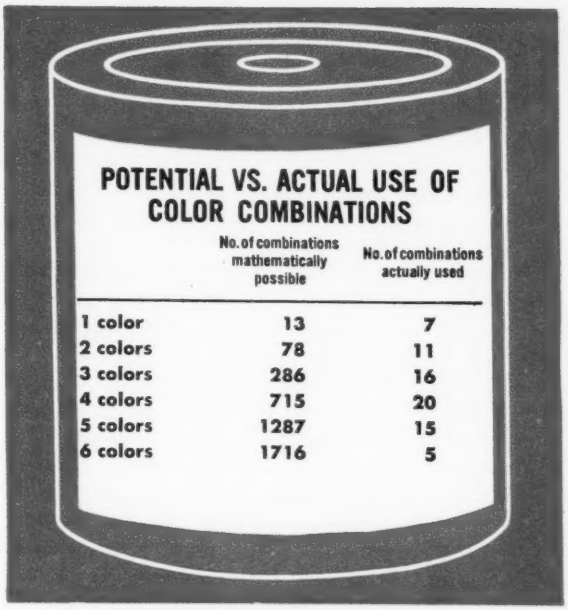
Yellow, the color of highest visibility in the spectrum, naturally finds widespread use.

Green, which also ranks high in preference, seems to lend itself chiefly to certain restricted uses.

Beyond these four colors (recognized as primary by the psychologist), few other hues or tones have been employed in the majority of successful packages. Probably there is good reason for this. While odd shades, blue-greens, yellow-greens, lavender, pink, etc., may be individually and intrinsically beautiful, they lack primitive and primary qualities and hence fail either to compel the eye or to impress the memory.

Finally, here is a practical check list of objectives for the design and coloring of a package. The six points should achieve an effective and profitable result.

1. The first duty of the package is to command the eye. Here color is perhaps most vital.
2. After it has caught the eye, the second duty of the package is to tell what it is and to establish its identity. Here typography and design are important.
3. The third duty is for the design and the color scheme to be appropriate to the product contained. What factors in design and color seem to lend themselves best to a particular item?
4. The fourth duty of the package is to please the eye and the emotions. A startling package that catches the eye but fails later to please is not so good a package as is one that achieves both.
5. The fifth duty of the package is to invite handling and further examination. This is where neat



2—Certain color combinations are more effective than others. A marketing study[1] has shown that only a small percentage of possible combinations are used.

[1] *Color Hits and Fumbles*, Modern Packaging, XIV, No. 5 (Jan., 1941), p. 23.

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details count and where the customer is urged to open his or her pocketbook.

6. The sixth duty of the package is to be well constructed, durable and handy in use.

Ultraviolet radiation raises havoc with many food products. Here color offers an effective control. While ultraviolet light has little power of penetration, certain plastic sheets are fabricated by industry today to transmit its energy; conversely, some kinds of window glass are manufactured to screen it out.

Brown bottles for beer represent another functional application of color to thwart the evil action of light. On the market today will be found amber cellophane, especially made to admit clear visibility of certain food products but to deny access to harmful rays. Further, light colors on packages will resist heat and thus help to prevent a too-rapid deterioration of their contents.

Where the product is to be seen and is, therefore, placed in a transparent container, some hues are superior to others for this purpose. In a study conducted by the Food Research Division of the U. S. Department of Agriculture, these facts are mentioned: "Light has long been known to catalyze this form of spoilage (rancidity in oil-bearing foods), but not until recently has it been shown that certain wave lengths of light promote rancidity more than others do. Investigations have been conducted by the Bureau of Chemistry and Soils with various color filters chosen to absorb known wave lengths of light, so that all regions of the spectrum were used selectively for radiation. . ." The ultraviolet portion of the spectrum catalyzes rancidity the most, while the violet, "indigo and blue of the visible spectrum appear to be next in activity. Yellow, orange and red are also active in producing spoilage by rancidity, but about twice the amount of irradiation with these wave lengths is necessary to produce the same amount of change or spoilage as with blue. The green region of the visible spectrum and the infrared of the invisible appear to be practically inert to rancidity development. Oil-bearing foods are, of course, best preserved from the development of rancidity when protected from all light."

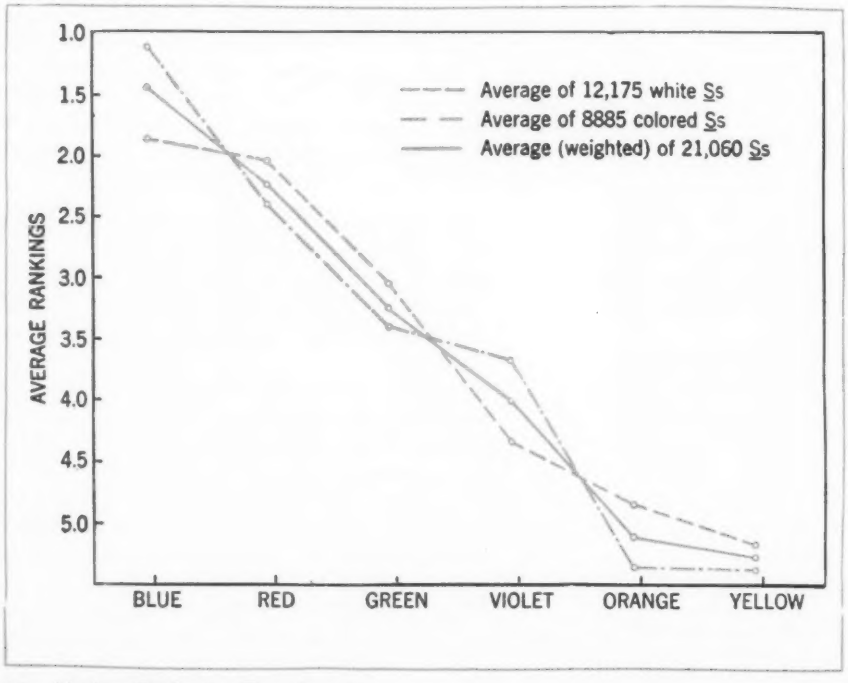
Apparently, there is need for further research—for instance, on the deterioration of vitamins. An item in the *American Journal of Pharmacy* points out that: "The substitution of glass jars for cans may well result in destruction of the riboflavin and even ascorbic acid in preserved fruits and vegetables unless the glass container is protected from light."

For strange exploitations of color the effort does not always have to be complex and scientific. It was a cannery packer of fish who, when he had a run of white salmon, labeled his can so as to give assurance that: "This salmon is guaranteed not to turn pink." Thus he prepared his customers for the light color and perhaps insinuated the disturbing thought that other salmon turned pink.

The appeal of color calls forth many associations with the other senses besides sight. The eye is highly discriminating about the appearance of foodstuffs destined for the stomach. The observation has been made that: "We would resist blue mashed potatoes, purple bread and yellow-green steak, no matter how delicious." Why not, in the merchandising of foods in packages, respect this psychological trait in human nature?

The curious power of color to influence human moods and attitudes is well recognized. Because color is an emotional thing, it is being engineered today to do a fitting and appropriate job—one that is purposeful as well as appealing. The reaction of the customer, when these aims are achieved, will probably be favorable.

DIAGRAM, COURTESY MCGRAW-HILL BOOK CO., INC.



3—Diagram showing the average rankings of color preference of over 21,000 observers, classified according to race. Survey was made by H. J. Eysenck.

Standards for Color Identity

American Colorist: Designed by Faber Birren and widely used in horticulture, art and industry. Charts contain over 500 samples printed in 12 process charts. The Crimson Press, Westport, Conn.

American Standards Association: An important recent standard for color identification is that issued by American Standards Association, New York, *Specification and Description of Color*, Z44-1942. Approved by a number of associations and manufacturers, it recommends the use of the Recording Spectrophotometer, the Munsell System and the Inter-Society Color Council method of designation.

Artists' Oil Paints: Minimum standards to assure satisfactory color, working qualities and permanence in oil paints used by artists. Adopted by a conference of manufacturers, distributors and users. Commercial Standard, CS98-42, U. S. Department of Commerce, National Bureau of Standards, Washington, D. C.

Baumann Color Guide: A card index system containing over 1300 standards, with extra booklet showing complete samples in smaller size. Original edition was in German, although an edition with English text has been produced. (Current source of distribution unknown.)

British Colour Council: A dictionary of 180 samples of dyed silk, used and accepted by British industry to standardize color names. Published in London.

Camouflage Colors: A series of nine colors used as standards by the Army. Specification T-1213, Supplement A and B, U. S. Army, Corps of Engineers, Washington, D. C. Also—*Color Card for Camouflage Finishes*, issued by U. S. Air Corps. Contains 8 samples, including insignia red, white and blue. Air Corps Bulletin No. 21.

Color Kit: Designed by Faber Birren. Color identification is achieved through the use of disks and a mechanical spinning device. Numerical proportions are developed for all notations. The Crimson Press, Westport, Conn.

Color Materials for Art Education in Schools: Recommended commercial standards for school art materials, chalks, crayons, water colors, etc., prepared by the Crayon, Water Color and Craft Institute. Commercial Standard TS-3961, U. S. Department of Commerce, National Bureau of Standards, Washington, D. C.

Dictionary of Color: Written by A. Maerz and M. Rea Paul. Shows over 7000 samples, with color names based on historical origins and current usage. Published by McGraw-Hill Book Co., New York.

Drugs: U. S. Pharmacopœia and the National Formulary designate the colors of drugs by name in their monographs. The National Formulary uses the ISCC-NBS system of color designations and about one-third of the monographs in the current issue of the U. S. Pharmacopœia uses them. Work is planned which will put the remaining monographs on this system. Description of the system and of the methods of applying it to drugs and chemicals are given in: *Method of Designating Colors*, RP1239; "Instructions for Determining the Color Names for Drugs and Chemicals," *N. F. Bulletin, 8*, 359 (1940); "Central Notations for ISCC-NBS Color Names," *Journal of the American Optical Society, 31*, 587 (1941); "Specification and Description of Color," *ASTM Bulletin*, p. 19 (December, 1942).

Du Pont Color Code for Safety: Designed in collaboration with Faber Birren. System contains 8 color standards used for purposes of safety and identification in industry. E. I. du Pont de Nemours & Company, Finishes Division, Wilmington, Del.

Flag of the United States: Scientific definitions of the red, white, blue approved by all departments of the Government, Section IV, Federal Standard Stock Catalog, Specification TT-C-591, July 3, 1934. Superintendent of Documents, Washington, D. C. (The Textile Color Card Association has prepared samples of these colors, also the flag colors of the South American Republics.)

French Color Standards: Two widely used French sources for color standardization are: *Code Universel des Couleurs* by E. Seguy (720 samples), and special books published by The French Society of Crysanthemistes.

Hiler Color Chart: A system of color harmony and color identification in chart form. Later edition contains 162 samples with card index box containing mask matching apertures and showing mat and gloss finishes of the colors. Available through Favor, Ruhl & Company, Chicago and New York.

Inter-Society Color Council: An effort to develop a standard designation for colors, using words commonly understood. Approved by various associations and applicable to widespread use in science, art and industry. *Research Paper RP1239*, U. S. Department of Commerce, National Bureau of Standards, Washington, D. C.

Kitchen Accessories: A group of six colors for kitchen accessories: white, kitchen green, ivory, delphinium blue, royal blue, red, accepted by the National Retail Dry Goods Association and approved by a conference of manufacturers, distributors and users. Commercial Standard, CS62-38, U. S. Department of Commerce, National Bureau of Standards, Washington, D. C.

Lubrication of Machinery: A proposed code (1944) for the use of color as an identification in the lubrication of machinery. There are 5 color standards for oils and 3 for greases, to be used on containers, fittings, etc. American Standards Association, New York.

Maple Sirup; Standard Color for Grading. Available from Agricultural Chemical Research Division, Bureau of Agricultural Chemistry and Engineering, U. S. Department of Agriculture, Washington, D. C.

Munsell: The *Munsell Book of Color* is the most widely accepted system of color identification in the United States. New edition, in two volumes, contains 40 charts and over 900 samples. Published by Munsell Color Company, Baltimore, Md.

National Electrical Manufacturers Association: Standards have been established for the colors of flexible cords, glazed cotton braids, control cables and type SN building wire (see Textile Color Card Association).

Nu-Hue Color Directory: An elaborately boxed series of color standards in actual paint—over 1000 in number, and all mixed from a basic palette of paint

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toners. Published and distributed by Martin-Senour Company, Chicago, Ill.

Ostwald: The Ostwald system of color, widely used in Europe, England and America, contains over 600 samples. Two series of standards are available, one produced by Winsor & Newton of London and New York, and the other by Container Corporation of America, Chicago, Ill.

Plochere Color Guide: One of the most complete sets of color systems ever produced in America. Contains over 1000 samples, boxed and indexed. Available through G. Plochere, 1820 Hyperion Ave., Los Angeles, Calif.

Poisons, Explosives, Gases: The Interstate Commerce Commission recognizes and insists upon special labels for shipment of gases, inflammable liquids, explosives, acids, etc. The colors generally used are white, black, yellow, blue, green.

Process Colors: Adopted (1927) by the Standardization Committee of the American Institute of Graphic Arts and approved by the American Association of Advertising Agencies and the National Association of Advertisers. Recommended standards for process red, yellow, blue, black.

Ridgway: The most renowned historical work in America. Contains about 1000 samples, each identified by name. Widely used by archaeologists and naturalists. Published by Robert Ridgway, Washington, D. C., 1912.

Textile Color Card Association: Seasonal color cards for the styling of consumer merchandise are issued at regular intervals to members. However, the *Standard Color Card of America*, Ninth Edition, contains 216 samples and represents staple colors having continual acceptance over the years in a wide variety of products and industries. This book may be used for reference on the following standards: U. S. Uniform Colors; Official Colors of WAC; Colors of Ribbons for Decorations and Service Medals; U. S. Flag Colors; Army-Navy "E" Pennant Colors; Standards set up by National Electrical Manufacturers Association and Radio Manufacturers Association.

U. S. Army Color Card: Army colors standardized for the different arms and services and approved by the Quartermaster General. Issued by Textile Color Card Association, New York.

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Preparing art for reproduction

by H. C. Minnich

One of the important steps in the production of packaging materials is the preparation of the finished art work for the illustrative and typographical matter. After all, what appears on each finished package unit is simply a reproduction of the original art work. Therefore, it is important that all of the elements of that art work be carefully prepared so that the best possible reproduction will appear on the finished packages.

It is the purpose of this article to discuss in as simplified and practical a manner as possible what is required of finished art work in order that good reproduction of a package design may be obtained. All of the ramifications will not be treated; we shall merely outline some of the more important and fundamental principles which, if followed, will lead to better reproduction at less expense. Our illustrations are actual "case history" material, showing packages on which full color designs have been successfully reproduced, and the type of art work employed in the reproduction process.

In the first place, it would be well to review the general types of art work used in the various reproduction processes. Elsewhere in these pages appears an article which deals in detail with each printing process available for reproduction purposes (p. 68). Therefore, the processes, which include letterpress, offset lithography and gravure or intaglio printing, will not be discussed here. While it is true that art should be prepared somewhat differently for each process, generally speaking, art work which is good for one process is good for all.

Types of art work

In general, art work for reproduction on packaging materials may be classified into the groups listed below:

Black and white copy—This group comprises all copy which is to be reproduced in line or Ben Day, whether it is to appear in black and white, in flat color or in color tints. It includes such art work as hand-lettered headings, captions, brand names, trade-marks, line illustrations, body type and working drawings.

Black and white photographs and drawings—In this group are included black and white photographic prints, retouched photographs and wash drawings from which black and white or one-color half-tone reproductions are to be made. Duotone reproductions also are made from this type of copy, as are multiple color reproductions in which all of the colors are "faked in" by the platemaker.

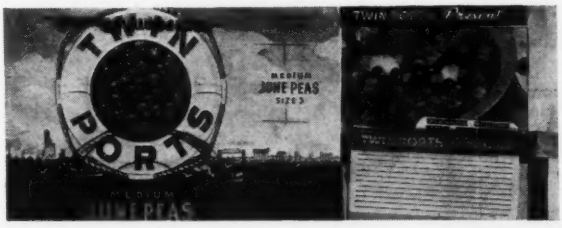
Full color photography—This group includes full color transparencies (Kodachromes, Ansco color, etc.), photographic prints made in full color on paper by one of several methods (Carbro, Kodacolor, etc.) and hand-colored photographs made from black and white photographs colored by an artist with transparent or semi-transparent colors. Full color reproductions are made from this type of art work, usually from process plates.

Full color drawings—Within this group are artists' finished sketches in water colors, oils, crayons, wash, etc. Full color reproductions also are made from such copy, usually from process plates.

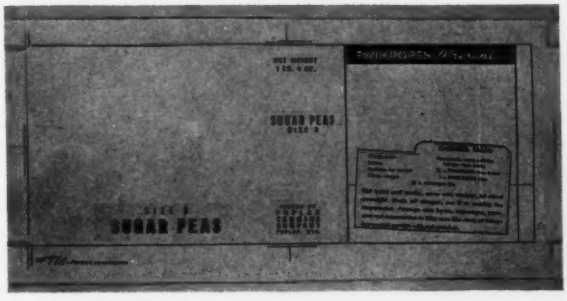
Each of these general types of art work has its particular job to perform in the reproduction processes. Each has its advantages, depending upon the effect desired. For example, at times it may be more desirable to use a full color artist's drawing rather than full color photography because of the particular effect desired in the finished reproduction. On the other hand, it may be preferable to use full color transparencies or photographic prints in order to obtain greater realism in the finished job.

In any event, there are right and wrong ways of preparing copy for each of these classifications. It is well to keep one fundamental principle in mind in preparing any kind of art work for reproduction: no reproduction can be expected to be better than the original art work from which it was reproduced.

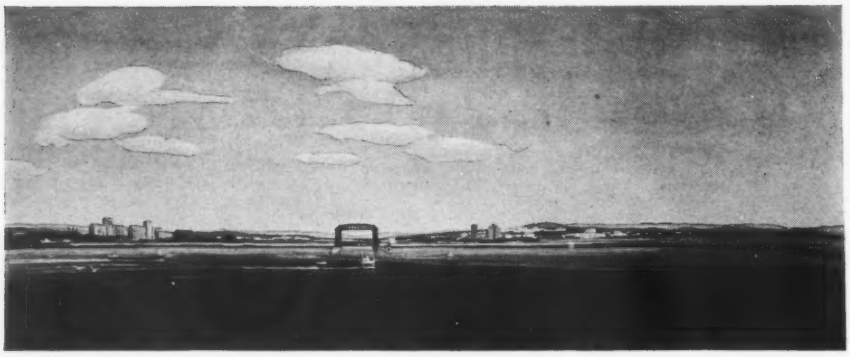
1—The first step in planning a label is the preparation of the rough color comprehensive art layout.



2—Working drawing is paste-up of hand lettering and typography, with register marks for other elements.

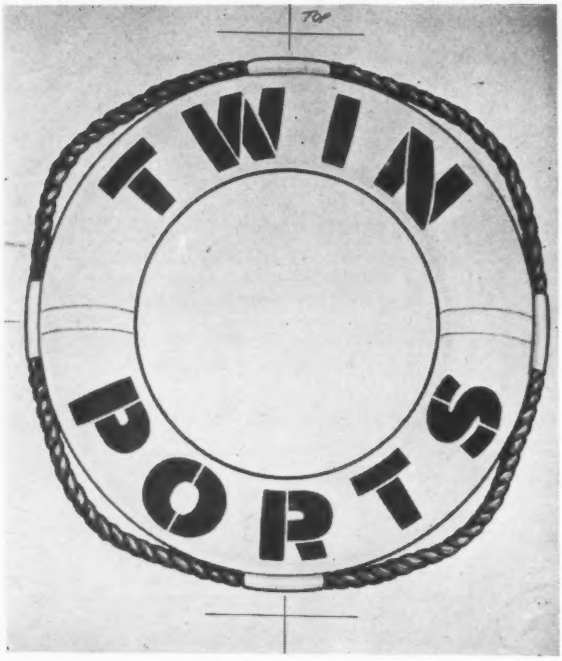


All photos reproduced through the courtesy of: The United States Printing & Lithograph Co., The Montana Flour Mills Co. and The Poplar Canning Co.



3—This particular full-color drawing for the label was made twice its normal size in order to handle the reproduction for several different sizes of cans.

4—Separate black-and-white drawing of brand name permits "positioning" on labels of various sizes.



5—Finished label, as it was reproduced in four-color offset lithography, from art work depicted above.



Preparing black and white art for line reproduction

All art work prepared in black and white for line reproduction in black, flat color or color tint should be in one size or focus and preferably in one piece. This would include hand lettering, body type and line drawings. All material should be pasted in its proper place in the layout. This is commonly known as the working drawing. It may either be made in the actual size of the reproduction required or, on smaller reproductions, it may be more desirable to make the working drawing 50 per cent larger so that the finished piece will take a one-third reduction in reproduction. The important thing to remember is: all elements must be in the same focus and in exact position. This saves time and expense in the reproduction process. It is important that all lettering, type and line drawings be firm, sharp and clean.

In preparing black and white hand lettering or line drawings, it is often desirable for the artist to work up one-half from the size of the finished reproduction. This art work can then be reduced to actual size by a black and white photo print (Velox print) and placed in its proper position along with the typographical matter on the working drawing. This procedure makes for sharpness and is particularly desirable where the reproduction is to be small. Black and white photo prints are much more desirable than photostats in making the reduction.

In preparing the typography for reproduction, care should be taken that all type is sharp and clean. Avoid fine delicate type, especially serif type faces, if the type is to appear in reverse (when copy appears white on black or other solid color).

When planning to use small illustrations, it is well to use simple drawings which can be reproduced in line rather than half-tone. Care should be used in handling small type in reverse.

Where flat color or color tints are desired from a black and white drawing, these should be indicated on a tissue overlay in their proper values. It is often advisable to have the color values indicated on the overlay made separately on illustration board. In this case, the key lines should be indicated in light blue or in a light neutral color. The color values should be indicated in black and may be washed in or stamped in, depending



6—For folding carton, "dummy" of the carton, on actual stock, is used for the rough color art layout.



7—Working drawing is made in actual size, and includes all elements to be reproduced in flat colors.

upon the effect desired by the artist. This method is generally superior to Ben Day, and can be used with a much greater amount of flexibility by the platemaker.

Art for full color half-tone reproduction

In the preparation of art work for full color reproduction, it is most desirable that the color photograph or color drawing be accurate as to color, correct as to detail and perspective. Here again, it saves time and expense if all color art work can be provided in one focus and, if possible, in one piece. If not, it becomes necessary to strip in the color negatives in their respective sizes and positions in the reproductions.

In direct color photography, the maker of the Kodachrome or Carbro, as the case may be, generally furnishes separation negatives. Such negatives have continuous tone and carry greater values than it is possible for the platemaker to obtain from the color photograph itself. A set of separation negatives consists of three different negatives, one for each of the primary colors, yellow, red and blue. The fourth color, if it is black, is usually secured from the blue negative, or, in some cases, from the red, depending upon the values obtained and the subject photographed. If the reproduction requires more than four colors, they can be obtained from the three separation negatives. Just which negative is used in obtaining the extra colors depends upon the judgment of the platemaker.

Thus, for best results at least expense, it is desirable to supply all art work for line and Ben Day in one piece and in one focus, and to supply all art work for full color half-tone reproduction in another piece and in one focus. This facilitates the handling of both types. However, it is not necessary that the line material and the full-color half-tone material be in the same piece of copy or focus since each is handled separately in the making of the reproduction negatives.

When preparing art work for reproduction, if there is any doubt as to what is desired, or if special effects are required in the reproduction, it is always best to consult the engraver, the printer or the lithographer before proceeding. As a matter of fact, it is always good policy to have a complete understanding with all parties involved in the reproduction process, to find out from them just what is most desirable.

8—The original art work is color photography, in different focus from black and white line material.



9—Here is the finished carton reproduced from the art work shown by four-color letterpress process.



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Methods of reproducing package designs

Packaging has occasion to make use of a wider variety of the graphic arts processes than any other industry. This is because of differences in the products, differences in the packaging materials, differences in package functions, differences in merchandising conditions and differences in consumer needs. Fortunately, the graphic arts offer a sufficiently wide variety of processes to meet all these varying demands. Reproduction methods and techniques have been developed to cope with the increasingly exacting demands of competitive package design with its wide range of color, illustration, typography and materials. Whatever the requirements may be, the package planner is able to find a suitable reproduction process. He need only select the most appropriate technique for his purposes. This calls for a thorough study of those purposes, the materials used, the quantity desired and the cost factor.

The following five articles, each by an authority in his respective line, describe the techniques of the various processes. They are intended to assist in the selection of the proper process for the reproduction of any package design. For information about techniques employed in reproducing designs on plastics materials used in packaging, see the article on p. 457.

Letterpress

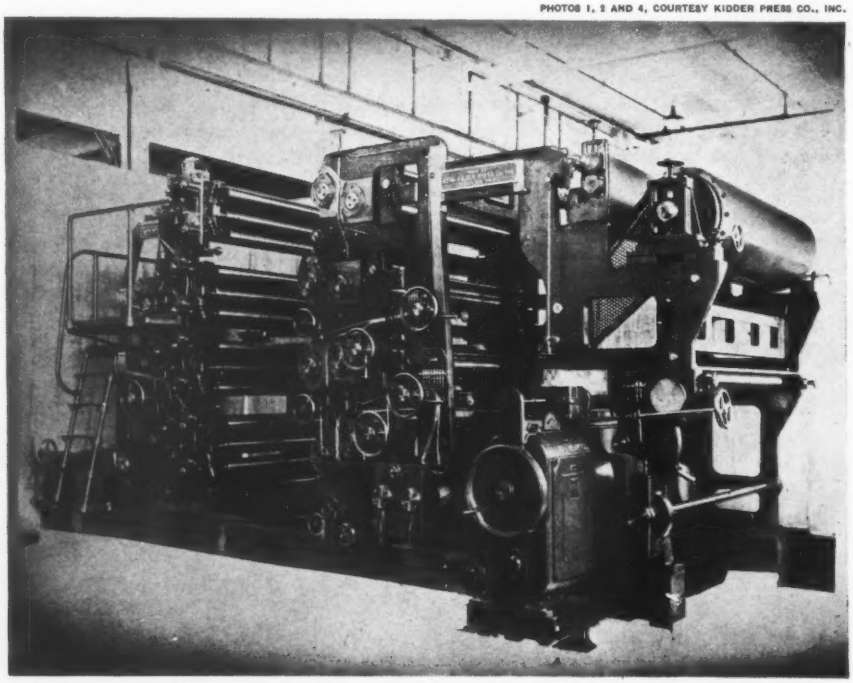
by Edward J. Peal

Someone has stated that the oldest process of printing is the one from which gravure is derived. Certainly the next oldest must be letterpress, familiar to most of us as the one used in job printing houses and for daily newspapers and for most of our books. In the packaging field, it is used in a variety of ways.

The invention of the process is generally credited to Gutenberg, who, about 1400, is supposed to have carved out of wood a reverse plate from which he printed an imitation of hand-written Biblical manuscript. It is hinted by some writers that he sold these as original hand-written manuscripts until someone noticed that errors in one copy appeared identically in other copies. One writer tells how Gutenberg accidentally dropped the wooden block upon which he had carved the reversed plate and that the block shattered into several pieces on the floor. As he put these together, he is said to have conceived the idea of having each letter as a separate piece which could be used over and over again as we now use the cast letters in a print shop. From some such an humble beginning has come the process which is now used to print the fine multicolor work which has such realism that letterpress is considered to be one of the best methods of obtaining full color reproduction.

Although press construction has become a little more complex, the process itself is still simple. Essentially it consists of the placing of ink on paper. Originally the letters to be printed were arranged as on a flat platen. Even when the letters became separate pieces, they were still arranged this way. They were then covered by

PHOTOS 1, 2 AND 4, COURTESY KIDDER PRESS CO., INC.



1—Four-color rotary press is equipped with Reeves constant tension rewinder and a single drum back-waxing device to eliminate offset. It is employed for the reproduction of food wrappers.

means of a hand dauber with a sticky ink, the sheet of paper was placed over them and pressure was applied to transfer the ink from the raised portion of the letters to the sheet. Apparently the word "press" springs from this original method of printing. As time went on, instead of printing from the original letters, a duplicate plate was made and mounted on a wooden block and this is still in use in the flat bed press.

Presses

At present, as in the period immediately preceding the war, many kinds of presses are used in this process. The flat bed press, in which the plates or type are perfectly flat and are inked by being passed under a series of inked rollers, is used to produce a very high grade of work. With this press, printing is accomplished by passing the inked plates under an impression cylinder which carries the sheets of paper down against the plates and then delivers them to a delivery mechanism which in turn places them in a pile.

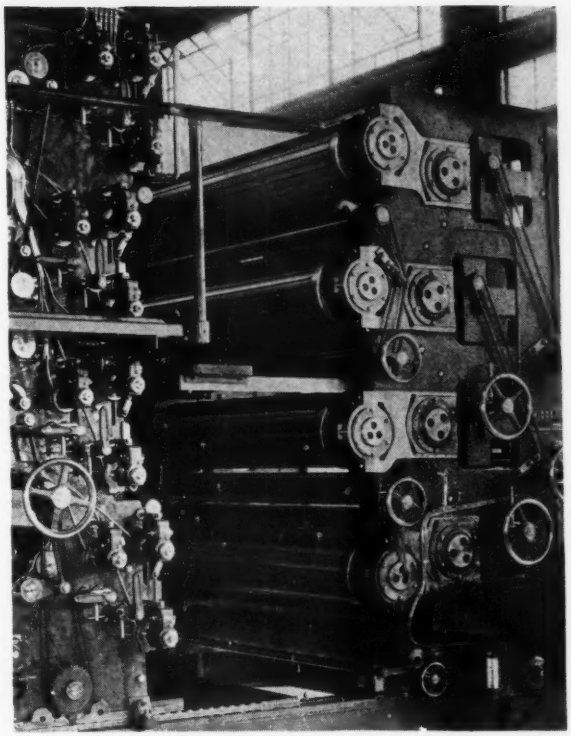
Another kind of press is the completely rotary type in which the plates are curved and are clamped onto cylinders. The cylinders rotate past a series of rollers to receive the ink and then rotate against the impression cylinder and transfer the ink to the paper. Presses of this type may handle paper from rolls and are known as web rotaries; or they may handle paper in the form of sheets in which case they are sometimes called sheet rotaries. Another form which this press may take is one in which the paper is fed from a roll and cut into sheets immediately before passing between the plate and impression cylinders. Such presses have been built to print several colors at one time, and there are some in which as many as six colors are applied to the sheet or web in one pass through the press.

The web rotary, referred to above, is one of the most commonly used in the production of newspapers and in the production of food wrappers such as parchment and waxed wrappers for biscuit and other food cartons.

We hear a good deal now of the process known as aniline printing. This is essentially a branch of letterpress printing and the word "aniline" refers to the type of ink used in the early days of the process. The process has, however, outgrown the original aniline ink (a dye dissolved in alcohol) and should now perhaps be more specifically referred to as a fluid ink or even a spirit-ink process. The plates used in the aniline process are made of rubber or plastic materials which can be readily wrapped around a cylinder and fastened in place by a sticky substance. The fountain used in this process is much simpler than that used in the conventional letterpress process in that it requires only two rollers with a pan to contain the ink.

Development of letterpress accessories

It might be well here to tell something of the development of accessories for the letterpress process. We stated above that the original plates were made of

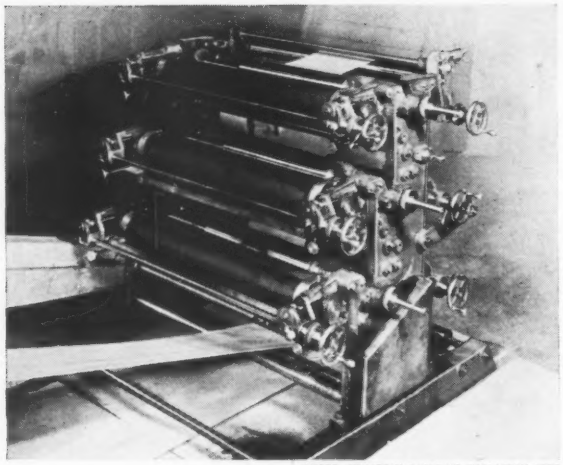


2—A 65-in. interchangeable cylinder letterpress printing unit for reproducing box and bread wraps.

wood. The first individual types which followed the wooden plates were also made of wood. However, it was not very many years before molds were made and the separate types were being cast out of material which perhaps resembled our present type metal. In a job printer's plant, we see cases of letters arranged for easy assembly into words and paragraphs. Actual printing is done from this assembled type, however, only where a comparatively small number of sheets are to be printed. Where a considerable amount of printing is to be done, it has been found advantageous to make what we call an electrotype or a stereotype using the assembled type letters as a master.

To produce an electrotype or stereotype from individual letters, we must first assemble the letters and cuts as if we were going to print the job and then make an impression from this assembled group of letters. The impression is made in wax for an electrotype and in a paper-like matrix for a stereotype. In the case of the electrotype, the impression in the wax is dusted with graphite to make it an electrical conductor and then copper plating is applied to this impression. Next, the thin plating of copper is backed up with type metal to make a solid plate. In the case of the stereotype, after the type matter has been impressed into the paper-like matrix, the matrix is placed inside of a casting machine and molten type metal is poured into it to make an exact duplicate of the set-up type. Electrotypes are generally made in the flat form and then curved, whereas stereotypes are cast in the shape in

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PHOTO, COURTESY BAGPRINT MACHINERY CORP.

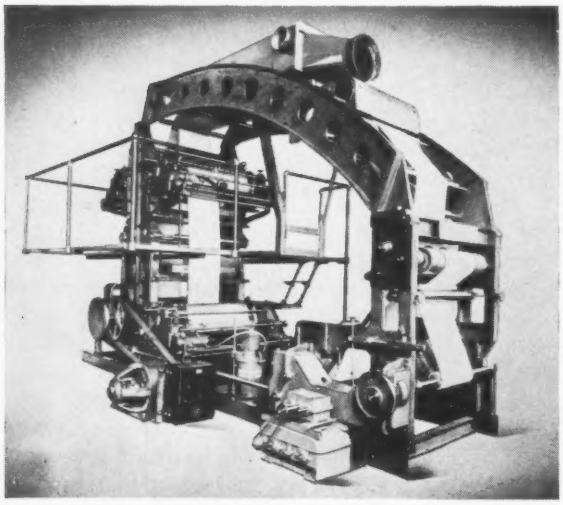
3—This three-color aniline printing press is equipped to take 33-in. web, and print on 30-in. surface.

which they are to be used—usually, in the form of a portion of a cylinder.

To produce a rubber plate, the type matter is set up in much the same way, but instead of impressing it into wax or into a paper-like material, a rubber compound or a plastic material such as urea-formaldehyde is employed and is cured while in contact with the original type.

This matrix, in turn, is then placed into a heated press and a suitable amount of gum rubber is placed over it, pressure is applied and the whole is cooked for a sufficient time at correct pressure to vulcanize the rubber in the exact shape of the original type. With skilled operators, extreme care and good equipment, it is now possible to make rubber plates which have a thickness variation over their entire surface of less than 0.001 of an inch. Such plates used on an accurate printing machine with either an oil or aniline ink will give surprisingly clean-cut impressions on paper, cellophane, acetate and foil.

4—A conventional letterpress machine which uses aniline inks. This process has the advantage of inexpensive preparation as well as drying quickly.



Inks

When we read some of the formulas which were used to make ink back in the early days of printing, we are reminded of a witch doctor who put in some ingredients merely to confuse his imitators. It is certainly amazing to think that such inks ever did dry satisfactorily. As a matter of fact, until quite recently drying was one of the big problems in the handling of letterpress printed materials. However, several types of ink have now been developed which either dry at once or dry with the use of suitable heating or cooking apparatus. With one ink which is in common use, the printed sheet is passed under a series of gas burners so that the solvent is literally burned out of the ink. Another type of ink which is now coming into wide use in the wax paper industry is one which dries upon contact with water vapor. For use in the aniline type of press, there are many new inks which carry a very heavy percentage of pigmentation and which, even in thin films, have a very surprising opacity.

It has been stated that since the very early days of printing nothing really new has been added to the basic process. While it is true that the principles upon which the process operates seem to be almost as permanent as the laws of physics, it must be admitted that improvements in press operation during the past 50 years have been such as to astound the critics. Perhaps one of the greatest improvements is in the matter of accuracy. The need for accuracy in the press has been realized for some time, but it has been stated that the platemaker did not furnish a plate as accurate as the press could use. This matter seems to have been remedied, and it would now appear that the platemaker is putting pressure on the manufacturer of printing machines to supply presses as accurate as modern machinery can possibly make them.

Other processes may rival the letterpress, but for the ability to produce definite results with distinct outline and pleasing appearance and to go on producing these results year after year, the letterpress seems to have many advantages.

Offset lithography

by H. A. Porter

The advantages to be gained by use of the offset lithography method in package printing are many and varied. The ability of lithography to reproduce on an extensive variety of stocks, particularly its ability to reproduce half-tone details on coarse surfaces, is one of its most important features. The offset method is the most logical for lithographing on metals, such as tubes, cans, containers and foils, because of the rubber blanket principle.

Permanency of lithographic inks is proved by the

fact that roadside posters retain original shades despite being exposed to all elements of the weather. Savings are effected all along the line when packages are produced by offset. Make-ready is one economical feature, while estimates place the savings on ink at 25 per cent or greater by volume. Offset lithography, the youngest of the three methods of printing, is rapidly attaining an important place in the graphic arts industry.

Imprinting materials with lithographic inks is essentially a chemical process whereas letterpress and gravure are primarily mechanical processes. Lithography is based on the age-old fact that water and grease do not mix. The offset plate is chemically treated so that the printing area is ink-receptive and the nonprinting area is water-receptive. The plate is placed on a cylinder, and with each revolution the image is transferred to a rubber blanket on the blanket cylinder. In turn, the image is transferred from the blanket to whatever stock is being lithographed.

Offset lithography has been used for years to print cartons and a large number of plants are successfully lithographing on boxboard today. The offset method was receiving increased acceptance for packaging in the years prior to World War II and will probably become one of the standard packaging methods of printing in the postwar period. Anything which can be photographed can be reproduced with great attention to detail by offset lithography and the flexibility of photomechanics is utilized to the maximum by the use of this method.

Important factors which must be considered in all printing processes are paper and ink and, in recent years, the quality of carton stock and inks has improved greatly.

Stocks up to 0.035 in. in thickness are being lithographed with maximum efficiency and properly made plates are running as high as 250,000 impressions. Replacement plates are quickly and inexpensively made from the same negative and changeover time is negligible since make-ready is virtually eliminated.

Equipment and supplies

Offset lithographic presses are manufactured in a complete range of sizes and in single color and multicolor models. Extensive engineering research and analysis by press manufacturers has resulted in equipment capable of producing high quality work at greatly increased speeds. Chemicals designed for lithographic platemaking are constantly being developed to higher standards of efficiency.

Offset lithography, because of its almost universal adaptability to a variety of printing requirements, is rapidly becoming the accepted reproduction process for an increasing list of uses. Its growth has been phenomenal during the past few years and the most conservative estimates point toward continued expansion in the period ahead.

The wide use of lithography during the war years by the armed forces did much to enlighten the graphic arts industry as to the great possibilities of offset reproduction. One of the nation's foremost color engineers recently said, "While watching the performance of a 50 in. by 69 in. four-color offset lithographic press running at several thousand impressions per hour with register lines making one fine black line, I realized that lithography can be entrusted with the work of the most meticulous designer."

Rotogravure

by G. N. Auerbacher

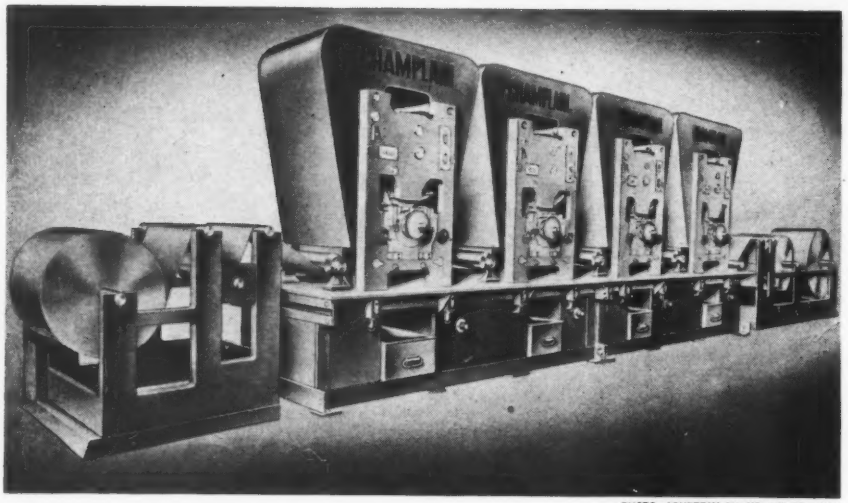
Rotogravure as a method for multicolor precision printing must be given important consideration by the modern packager. Not only does it offer opportunities

PHOTO, COURTESY HARRIS-SEYBOLD CO.



5—Large multicolor offset lithographic press in final stages of assembly, destined to be used extensively in carton production. This press is the first to be built since the war, and takes stock 50 by 69.

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PHOTO, COURTESY CHAMPLAIN CO., INC.

6—The modern streamlined version of a four-color rotogravure press, showing the rotary feed and re-roll equipment.

for package improvement, but it also may increase production output and decrease production cost.

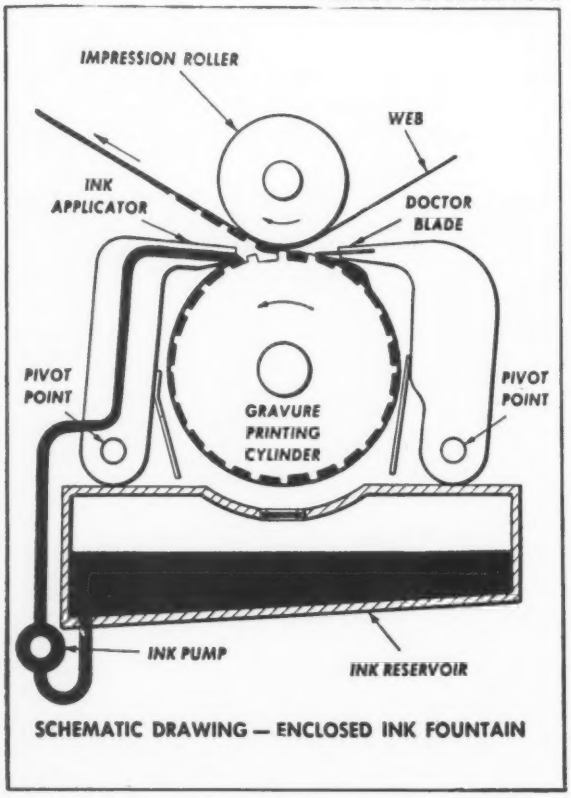
Modern rotogravure at high speeds will reproduce accurate line cuts and rich, soft half-tones on a wide variety of paper stocks, ranging from manila to pasteboard, cellophane, foil and glassine. Moreover, rotogravure can maintain strict color uniformity throughout a run and with absolute duplication of subject.

Rotogravure is an intaglio printing process in which the design to be reproduced is etched below the surface of the printing cylinder. This etch consists of minute cups or recesses which serve as vehicles to carry the ink to the stock. The walls that surround each cup are formed by screening before the design is etched into the cylinder.

The gravure cylinder is inked by revolving under an ink jet which not only fills the etch but leaves an ink film on the surface. This film is removed by an oscillating doctor blade pressing against the revolving cylinder. Walls surrounding the cups prevent this blade from wiping ink out of the etch design. A roller forces the moving web against the gravure cylinder, transferring the ink from the etched design onto the stock. The web is fed from a roll through the printing units and then it is either rewound or it may be passed into fabricating units.

7—Diagram of the enclosed ink fountain of a gravure press. The dry print of gravure inks saves time.

DRAWING, COURTESY CHAMPLAIN CO., INC.



SCHEMATIC DRAWING — ENCLOSED INK FOUNTAIN

Rotogravure presses

The great productive capacity of rotogravure printing is gained by the dry print of gravure inks which allows six colors to be printed as rapidly as one color. A high-speed, precision-built rotogravure press can apply gloss inks or lacquer and feed the web into mechanical devices for rewinding, sheeting, slitting, perforating and scoring without interruption and will deliver the printed desired form from a roll of plain stock. Only with instant-drying, highly volatile inks is it possible to print and fabricate in a single, continuous operation, saving valuable time, handling and space. The natural field for rotogravure is roll feed–rewind which permits speeds upward of 500 ft. per minute; but high speeds can only be obtained on precision-built rotogravure presses.

Excellent printing is a fine art and it can never be made to be completely automatic. Rotogravure is no exception. There are certain features of rotogravure printing, however, which minimize the number of adjustments necessary to ensure quality printing. As a finished gravure job is produced with a single pass of the

stock through the press, such conditions as tension, temperature and humidity are the same for all operations. This eliminates many of the difficulties of register control encountered when time must elapse for ink drying between printing the various colors and fabricating the printed result. On some of the more recently developed presses, register is accomplished by means of a patented 360-deg. running register control or an electric eye.

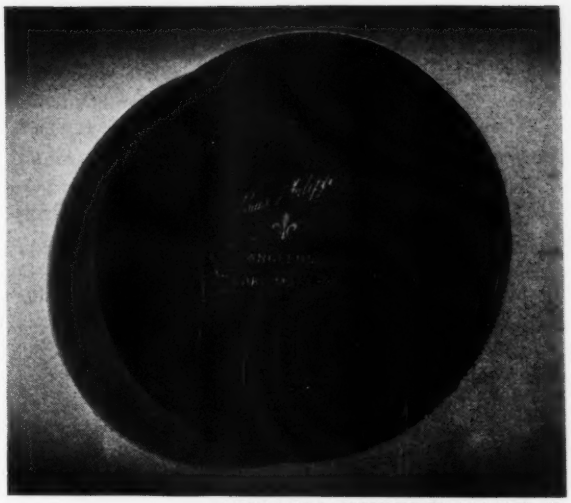
Rotogravure is simplified still further by the elimination of make-ready. Printing starts as soon as the cylinder is in place and the pressure of the doctor blade and impression roller is regulated. The impression roller on the newer presses is controlled by push button. Make-ready is the simple matter of applying the necessary pressure which is indicated on a gauge to parts of a pound. Impression pressure is predetermined by paper stock and adjusted accordingly. With the micro-impression control, web tension is held whether press is running or stopped.

There is no complicated ink distribution system, and there is no jumble of rollers to be adjusted or washed. The proper supply of ink is automatic. The dry print makes tympan rolls, slip-sheeting and sprays needless.

Press flexibility—Printing cylinders are not limited to a certain fixed circumference, but instead are free to vary within a wide range between the minimum and maximum size. This provides for the economical production of different sizes of work on a single rotogravure press. A large design might be repeated only twice around the cylinder, a smaller design five times around. In each case, the circumference need be just great enough to contain the design without a break or gap causing a waste of stock. Although the maximum printing width for each press is determined by its web size, narrower webs may be used to eliminate waste stock at the sides, should a design not require the full width.

Enclosed ink fountain—Another new development is the enclosed ink fountain which uses a completely new conception of ink application. The supply of ink, held in a closed reservoir, is pumped to the cylinder where it is fed through a slotted nozzle sealed against the cylinder surface. The oscillating doctor blade removes the excess ink from the surface areas, which are not intended to print, leaving the proper amount of ink in the recesses of the cylinder. All surplus ink is guided by the splash guards to the bottom of the fountain chamber where it is screened before returning to the reservoir. The ink remaining in the etched design is transferred to the paper under the impression roller which forces the moving web against the etched cylinder. This lifts the ink from the design onto the stock to be printed. As the ink dries almost immediately, the web may next be passed through other printing units or directly into mechanical devices to fabricate the printed result.

The sealing strips on the ink applicator, the doctor blade and the end shields which cover the space at the ends of the cylinder effectively enclose the ink chamber, making an entirely airtight fountain. Inks containing highly volatile solvents are used without handi-



PHOTOS 8, 9 AND 10, COURTESY PEERLESS ROLL LEAF CO., INC.

8—Roll-leaf marking process, used on cosmetic container, brings out beauty of the plastic material.

capping operation or damaging the printed result. Continual addition of new solvent to keep the ink uniform is eliminated. A saving in the amount of the solvents consumed is obtained.

An improvement in color register is found, as fast-drying inks permit shorter web leads between printing units. High temperatures for rapid drying which cause distortions in the web are not necessary. Shorter web leads and lower temperature drying result in a more compact press, an improved quality of multicolor printing and savings in waste stock.

Drying of residual ink in the etched cells is inhibited by continually flushing the engraving with fresh ink from the applicator. The continual circulation of the ink prevents the settling of pigments and maintains a constant consistency throughout the entire run. Splashing of ink on the web is prevented by the enclosure which also serves to keep foreign particles from the ink.

The structure of the latest gravure presses allows quick and convenient removal of side cylinder and tank as well as easy removal of inking mechanism. A complete change-over of color and cylinder design involves simply removing the cylinder and inking mechanism and replacing with fresh units. The press is then ready to roll and wash-up can be accomplished on other than press running time. On a continuous job, wash-up for overnight standing is a matter of wiping off a few inches of exposed cylinder. In the morning, the press is ready to roll again after two or three minutes of ink flushing.

Control of ink volume—The inherent characteristic of gravure, carrying the ink in a subsurface design, is an important factor in the superiority of its printing as it provides the opportunity for controlling the volume of ink carried to any given portion of a design. The etch consists of minute cups or recesses which vary in depth as required for the tone which they are to print. The deepest cups will naturally carry the greatest amount of

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ink. This produces a wide range of tonal expression from the richest depths to the purest highlight. The intermediate tones may be produced from as many as fifteen different depths of etch, from the same cylinder.

The finer screen, normally 150-line, which is used in rotogravure, reduces the screen effect in the printed result. This is aided by the blending of the ink from one cup with that from an adjoining cup after it has been deposited on the stock. This blending yields an excellent solid coverage of ink. Tone work, solid colors, lines and fine type may be combined on the same cylinder and printed with equally satisfactory results. Each receives ink to the full depth of its etch.

Uniformity of color

The important consideration of quality printing is color uniformity. In rotogravure, color uniformity is accurately maintained throughout an entire run and absolute duplication of subject is possible. The enclosed ink fountain is an important feature in maintaining color uniformity, for with the enclosed tank there is no solvent evaporation or variation of ink consistency. Inks may remain in the fountain reservoir overnight and may be used the next day without running the risk of a noticeable change which might impair the final effect.

The wide variety of stocks which can be printed by rotogravure includes papers such as label, coated, super, news, manila, English finish, tissue and kraft; paperboards such as sulfite, bleached manila, patent-coated and clay-coated; and miscellaneous stocks such as flint-glazed, foil, acetate, cellophane, glassine and other similar materials.

The advantage of gravure inks lies not only in their greater drying speed, but also in the ability of the process to handle the "difficult" inks. Metallic, gloss and varnish inks, all commonly required for package printing, are printed in the standard rotogravure unit with lay and color results that meet critical requirements.

Silk Screen

by Eugene Morley

The silk-screen process is rapidly coming to the fore as a means of decorating packages by imprinting directly on the surface. It is especially valuable in the cosmetics field where the appearance of the package and its counter appeal affect its sale so directly. Its use is increasing in the field for that reason, but it is also being used to a greater extent in some other fields where its practical aspect rather than its appearance is the factor. Many milk and soft drink bottles intended for re-use, as well as at least one top whisky bottle, are decorated or marked by the process and fired at glass-melting temperatures to form permanent imprints, thus eliminating a new labeling operation at each filling.

Since silk screen is a stencil rather than a printing process, it is often successful in combating problems well beyond the scope of true printing—letterpress, planographic or intaglio. Because its machinery is not as advanced as that of the true printing processes, it has some disadvantages which limit the number of its uses—mainly the disadvantage of greater cost.

Development of silk-screen process

As a process, it has a short but interesting history. Its development is entirely American, and the earliest use that has come to the attention of any writer on the subject is in the printing of felt pennants in 1910 or 1911.



9—Operator is applying trademark design to lipstick containers with roll leaf, on upright press fitted with dial feed.

The substance of the felt offered a difficult fibrous surface which received too little ink in other printing methods but accepted the heavy silk-screen deposit readily. By the late 20's its use became nation-wide as a medium for printing posters and display cards in runs too short to be practical in another printing method and too long to be practical in hand painting. Its means during most of this period were crude, and its uses were often limited to circumstances where its only advantage was low cost in short runs. The late 20's and early 30's saw some technical advances which mightily increased the scope of the medium and revealed new possibilities.

Applications

The silk-screen process is used at present in industries which must seem queerly unrelated unless one understands the nature of the medium technically. Among those fields are poster and display as before, and ceramics, textiles, wallpaper, instrument dials, toys and novelties, packaging, plastics, book illustration and—most unbelievably—the fine arts. In the last-named field it is used both as a reproduction medium for some of the world's finest paintings and as an artist's original medium similar to lithography and etching.

Technique and results

Silk-screen technique is at once simple and complex. Its rudiments can be mastered in an hour; yet a fine result can be achieved only by a master technician, and they are few since they have gained their experience only during the past two decades. The principle involved differs basically from that employed in the true printing processes since the stencil principle is called upon. Silk screen is stenciling quite as truly as is the act of a shipping clerk who stencils a destination on a packing box with the use of cut-out brass letters and a heavy ink-filled brush; it differs only to the extent that refinements have been introduced.

In the packing case stencil, the chief limitation is that the stencil will not hold together unless certain bridges occur in each letter to hold isolated centers in place. This is eliminated in the silk-screen process by using a stencil material more pliable than brass (usually lacquer or gelatin) and affixing it firmly to a tightly stretched mesh of silk or of metal. The printing material—which may be lacquer, enamel, ceramic or almost anything mixed with a suitable adhesive—is not now applied by means of a brush, but is, instead, forced by the action of a rubber squeegee through the mesh of the silk, through the stencil to printing surface beneath.

The deposit thus made is controllable in every respect. It may be thick enough to produce the dots of Braille type or it may be infinitesimally thin; it may be mat or gloss, opaque or transparent; and it may be any color whatsoever that is available as a pigment. Since the imprint made is a deposit rather than a "kiss" imprint, it is applicable to almost any surface firm enough to hold together. Each additional color requires a separate printing operation—no means as yet is available for applying several colors in one operation—but where the appearance of a package warrants a somewhat higher printing cost, as many colors as necessary may be applied in perfect register without any limitations as to the complexity of the design or the size of the lettering. In the case of one widely advertised package, nine colors were applied to the front and back of a stock bottle to form a three-dimensional effect which has set this package high among its competitors.

Most plastics now in use cannot be permanently imprinted in lacquer or enamel, the more familiar silk-screen materials, but the adaptability of this process permits the use of printing materials especially designed to form a permanent bond with the plastic surface.

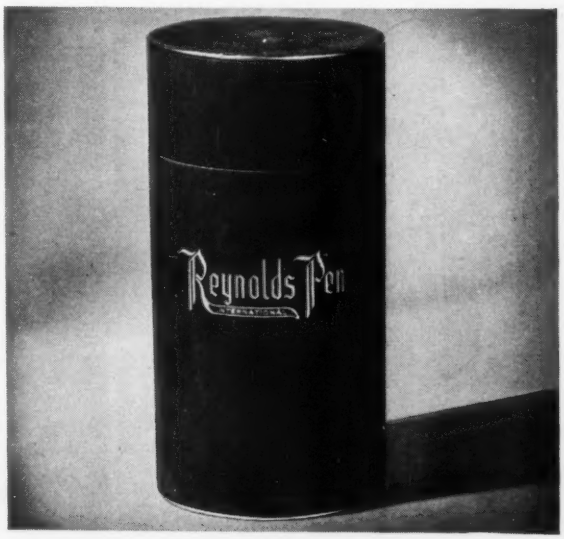
The war made its demands upon the silk-screen industry as it did upon all others. Again special printing materials had to be developed for imprinting containers for medicines and drugs in such fashion that the imprints would withstand successfully the conditions met in wartime uses. The most remarkable wartime use of this process was the imprinting of luminescent instrument dials for aircraft, submarines and other machines of war. The luminescent material was formerly applied by hand since its consistency made it impossible to apply by an imprinting process. Silk screen was able to solve the problem of calibrating these dials in production quantities, but only after a hard struggle. Tolerance requirements of ± 0.005 in. were not met until many trials were made and new equipment and methods had been devised.

Roll-leaf marking and embossing

by Alfred A. Morse

The roll-leaf marking and embossing process is a combination of engraving and printing methods. Lettering and designs are engraved or stamped into the surface

10—This display package is covered with flock paper; design is stamped in imitation gold roll leaf.



of the material at the same time the dry pigment color or bronze foil is transferred from a web of glassine or cellophane. Materials which lend themselves to marking with this method include: paper, board, cloth, fabric, leather, wood, fibre, hard rubber, plastics, etc. Under some conditions, it is possible to use this process for marking metal surfaces carrying a heavy enamel or lacquer coating.

Requirements

In order to accomplish roll-leaf hot stamping and embossing, three things are required: a stamping press, a roll of stamping foil and a brass or steel die, or type. Presses used can be classified as: platen presses such as Chandler and Price, Brandtjen and Kluge, and Colt's Armory presses; bookbinders' presses of the Sheridan and Seybold type; specially designed upright presses such as the Peerless. The Peerless press has been specially designed for roll-leaf hot stamping and is available in rotary models as well as in the upright models more generally used. Presses can be designed for hand operation, semiautomatic or fully automatic operation.

Very little make-ready is required for ordinary flat stamping such as for lettering or open trade-mark designs. Where embossing is required, make-ready is cut on the bed of the press. A roll of stamping foil of the required width feeds across the face of a heated die attached to an electric heating plate.

Since dry colors are used exclusively, no drying time is necessary. The stamped articles can be packed immediately or used in any of the subsequent manufacturing operations.

The roll leaf comes in several shades of genuine gold, imitation gold and silver, and a wide range of colors. Two or more colors can be used at one time if they do not interfere with each other in the design. Roll leaf is available in widths up to 24 in. Roll leaf is usually supplied in rolls 200 ft. long but can be had in special lengths if desired. Thousands of impressions can be obtained from the relatively inexpensive steel or brass dies or type.

Applications

Because of the varied characteristics of different plastics, marking or decorating such articles with roll leaf is sometimes difficult. Special presses have been developed for marking plastics, which operate under high pressure using steel dies. Articles of wood, on the other hand, offer no difficulty, whether the surface is flat or curved.

Another application is the imprinting of cartons. Ordinarily, quantities required must be estimated in advance and large stocks of folded and pasted blanks must be carried at all times by the manufacturer. By the roll-leaf hot stamping process, the necessity for this is avoided.

The manufacturer buys one type of blank in each size. As special imprinting is needed, a supply of the folded and pasted blanks is placed in the hopper on a carton-imprinting press, stamped automatically and ejected. Since no time is required for drying, the stamped blanks can be used immediately in packaging operations.

In stamping box tops and wraps, the printing is first done on a platen press and the printed blanks are then fed into a press equipped with a roll-leaf feeding attachment and heating plate.

Roll-leaf attachments of this kind are available for platen presses of the Chandler and Price or Brandtjen and Kluge types.

It is also necessary to employ a brass die for the part which is intended to be embossed with roll leaf. The purpose of this die is not only to release the foil but also to emboss the surface of the cover stock. The die is designed in such a way that it will serve both of these purposes in the same press operation, thus contributing toward production efficiency.

PHOTOS 11 AND 12, COURTESY CREATIVE PRINTMAKERS GROUP



11 and 12—Silk screen used in decorating the bottle and jar of this attractive cosmetics line supplements the other arts of package fabrication required for set-up boxmaking and specially molded glass containers.

Inks for peacetime packaging

by David Donovan

Not all of the wartime substitutes in printing inks were of the "ersatz" variety, and many developments brought about by the accelerated needs for new materials will have important applications in peacetime packaging. With new developments in printing inks have come improvements in equipment and techniques for applying them.

As every packager and designer knows, the first consideration in the selection of any package printing ink is the specific requirements of the individual job. These requirements depend not only upon the nature of the product packaged, but upon the techniques involved in the packaging process.

At the outset, the package producer (and ultimately the ink manufacturer) must consider these questions:

1. Must the package withstand heat or sunlight? How much?
2. Will the package be subjected to water or moisture exposure?
3. Must it be resistant to such deteriorants as soaps, alkalis, alcohol, oils, fats or perspiration?
4. Will the package be subjected to rough handling? Must it be rubproof?
5. Is it essential that the package be entirely odorless?
6. Are there any other special conditions which should be taken into consideration?

To answer these queries, the packager must have complete information from the manufacturer. And, in turn, the ink manufacturer must know all the answers to these questions if he is to formulate inks which will successfully meet the exacting requirements of a particular packaging job.

What is the current status of inks available for the packaging field? Now that the war is over, raw material shortages should ease. However, at the present time the shortage situation is still critical, due partly to a continued shortage of skilled technical labor. It is difficult to predict just how long these shortages will continue, but it seems fairly certain that inks for packaging will be more available before the end of 1946.

Letterpress inks

Letterpress, or typographic, inks are widely used in printing almost every type of paper container, and definitely improved inks are available. The development of the fast drying Vaporin type of ink a few years ago made possible faster speeds and a cleaner, clearer print for packages. In the bag field, to which this type of ink is especially well-suited, improved Vaporin inks now provide a finer gloss than previously, and there is no loss in the instant drying properties of the ink.

Another ink development important to packagers is the use of vapor-set inks. These are inks which dry in the presence of water, steam or other water vapor which may be introduced by several methods. They are used for many products; for example, on chewing gum wraps, bread wraps and for similar applications where an odorless ink is necessary. Three characteristics of these inks are important in food packaging:

1. *Drying speed*—They can be put through waxing machines within two hours after printing, compared with two days to two weeks necessary for ordinary inks.
2. *Lack of odor*—There is no odor at the time of printing, nor does any odor develop subsequent to printing.
3. *Heat sealing*—These inks have much greater sealing test than oil inks, permitting easier handling on the sealing machine and greater flexibility in design.

Moisture-set inks have particular advantages for printing corrugated carton liners. With ordinary inks there is a great loss of time and needless use of storage space involved in waiting for the liners to dry before they are printed. Moisture-set inks may be printed on green liners in which the presence of moisture will set the inks rapidly. This offers the possibility of carrying out a continuous operation from printing through instant drying and immediate scoring to the final fabricating and filling operations.

Offset inks

In the field of offset inks, a steady improvement in the quality of oil inks for use on paper may be expected as shortages ease. The development during the war of inks which may be wet-varnished for lithographing on tin promises to have important applications in the packaging field. With these inks it is possible to apply varnish on the ink while it is still wet, and then dry both ink and varnish in a single baking.

A new offset drying stimulator promises to speed production and improve sharpness of impression in offset printing on paper.

The quick drying Vapolith type of ink produced shortly before the war will undoubtedly expand with peacetime development. This ink dries instantly under application of heat and makes possible faster and cleaner package printing.

Gravure inks

The use of commercial gravure printing for food and beverage labels, as well as for bags, wrappers and packages, was increasing before the war began. Gravure

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PHOTO, COURTESY INTERCHEMICAL CORP.

Inks for package printing must often be formulated with pigments which specifically qualify for individual types of container. In this pigment synthesis laboratory, technician is making synthetic pigments to meet these specifications.

inks produce an effect which resembles a continuous tone, and they are adapted for printing on cellophane, carton stock, glassine, acetate and foil. If the surface to be decorated is reasonably smooth and pliable, it can be printed by the gravure method.

During the war, material shortages particularly limited the production of gravure printing. Such shortages are already reduced, and presumably will no longer be a problem by the end of 1946.

Gravure inks are available in almost all monochrome colors, and they also are employed as process inks for three- and four-color work. Gravure inks which may be used to create wood grain effects for boxes and wrappers will undoubtedly be widely used soon.

A production advantage for gravure printing is its adaptability to packaging machines. It is possible to install gravure printing units directly on packaging machines so as to synchronize gravure printing with slitting, rewinding, scoring, waxing, etc.

Aniline printing

Aniline inks were developed to meet the need for printing on webs and converting to other forms in one continuous operation. The principal advantages of aniline inks are simplicity of use, low cost, elimination of slip-sheeting and adaptability to a wide variety of materials. Aniline inks will print on cellophane, foil and many of the new synthetic packaging products which are difficult or impossible to print by oil or letterpress inks. Another important feature is the long life of aniline printing plates, as many as 1,000,000 impressions being possible from a single rubber plate. Aniline printing is now widely used for:

Bread wraps	Milk containers and paper cups
Foil bags and wraps	Cellophane bags and wraps
Gummed tape	Confectionery wraps
Glassine bags	Acetate wraps

Printing inks for plastics

The increased use of plastics, tremendously accelerated by metal shortages during the war, has resulted in a corresponding increase in the demand for production methods to produce lettering and design on plastic surfaces. Recent research in the field of printing ink has developed a relatively wide variety of inks which may be used for plastic decoration. This type of printing may be accomplished by any of the three principal printing processes: letterpress, offset and gravure. Other inks for plastic printing by aniline and silk screen methods are also available. Generally speaking, the type of surface is the main concern in determining the type of ink and the method to be used.

Color standardization

A problem which has long plagued the packager is that of color standardization. It is well known that packages printed in different parts of the country are difficult to standardize in so far as color is concerned.

A service, known as a color standard survey, was developed to help alleviate this problem. Through its use a manufacturer may have part or all of his packaging problems surveyed. To achieve consistent printing results, a set of rigid color standards may be set up for him, inks may be formulated for each color on every type of stock which will be used and the inks may be supplied to any plant in any part of the country. Such a survey, it is believed, will reduce rejects caused by the use of inks not suited to the job.

Redesigning of packages will be tremendously accelerated during this year. In fact, one authority predicts that 47 per cent of all packages will be redesigned. This means that color standardization, and services such as the color standards survey will be of particular significance and utility. (For further data, see *Color in Packaging*, p. 61; and chart, opposite p. 64.)

Using package surface

When the technical problems of protective packaging have been satisfactorily solved, the next question is proper utilization of package surface from a merchandising viewpoint. The solution to this question may well be approached from the premise that the package is a potential carrier of messages from the producer to the ultimate consumer. En route to that destination, the goods pass through the hands of wholesaler and retailer. The former—except in cases where he has his own private brands—is not particularly package conscious because his function is to handle the goods, usually in shipping cases, just as economically and as quickly as he can.

The retail store, however, is the last and most important way station on the road from producer to consumer. Retail stores, of course, differ in their ownership and organization—super market, chain and independent. They may differ in form and arrangement, but their function in all cases is practically the same—they are channels through which the goods reach the real customers.

The first concern of the manager or owner of a retail store, regarding any article in his stock, is its salability. Eye appeal and appetite appeal obviously are important factors in salability. Other things being equal, the retailer chooses the most attractive packages for his choicest displays in windows, on counters, on shelves or on open display tables. Some packages may well be designed for distant visibility in retail outlets. When there is an opportunity to, the retailer may often, in his conversations with customers, make use of the selling messages on packages.

Because of the remarkable increase of self-service merchandising, the external appearance of a package has come to have a vastly increased importance. Merchants in independent stores where there are clerks to care for customers' needs, as well as those operating stores laid out for self-service, have learned that the old bugaboo of pilfering never was as serious a matter as feared. Attractive packages may be safely displayed in the open, with little or no greater percentage of thievery than when they are kept under cover. Packages so displayed help to make "reminder" sales that might otherwise be lost. The package planner, therefore, in designing the package surface, will take into careful consideration the nature and type of retail stores through which his product sells.

But the principal attention of the package planner will be directed toward features that will make a favorable impression on his ultimate consumers. During the war years, of course, consumers have been happy to take what they could get; but signs are not lacking that the so-called "consumer movement" is taking up where it left off when the war interrupted. The "family purchasing agent"—the housewife, who is responsible for the purchase of 60–80 per cent of all goods sold—is seeking definite and exact information about what she buys. In retail outlets you will see women reading labels, comparing net contents, studying directions for use—in short, examining packages most carefully.

Package surface as advertising space

The fact that so much attention is now accorded to labels presents an opportunity to the producer: the package surface, in the light of its power to carry messages to the consumer, may be compared in some respects to advertising space. The buyer of advertising space has certain definite measuring sticks in evaluating

PHOTO, COURTESY MUIRSON LABEL CO., INC.



1—Ingenious two-way label has front half printed vertically, back half horizontally. With this design, label information is readable, whether can is standing or lying on its side.



2—Product name is given primary importance on this label. Effectiveness is heightened by illustration.

media, the most common of which are the following:

1. Size
2. Quantitative and qualitative facts about media circulation
3. Cost

Similarly, package surface may be evaluated. The average carton, for instance, measures perhaps 3 in. by 5 in. by 2 in., and has a total surface of 60 sq. in., of which a portion is visible for display purposes. Practically the entire area is available for informative material. The average metal can has a label which measures 11 in. by 4½ in., a total of 45 square inches. The visible panel on display measures about 17 sq. in., and the entire area is usable for information. Glass jars and bottles can be estimated in a similar manner—and glass containers have certain advantages in eye appeal which are not enjoyed by opaque containers.

The circulation of a package, considered as advertising, is of course the number of units sold. It may be regarded as a circulation owned and controlled by the manufacturer of the product—his to do with as seems best to him. Some enthusiasts go so far as to say that the package, in contrast to other forms of advertising, has no waste circulation because every unit goes to a consumer.

As to cost, one interesting estimate has it that 17 sq. in. of advertising space, in four colors, in a well-known consumer magazine would cost 54½ cents per thousand circulation—if it could be purchased in that way. It should be pointed out, however, that even if you could buy that area in a magazine, 17 sq. in. would be lost; on a package, that area can be made to dominate. The cost of package space, considered as advertising, is really negligible. As one package designer puts it: "You buy the package anyway—the advertising space really costs you nothing. Why not use it effectively?"

In deciding how to use this space most effectively, consideration must be given to three things:

1. What the consumer wants
2. What the law requires
3. What the manufacturer would like to emphasize

If possible, a manufacturer should endeavor to determine what information his own consumer customers wish on packages. That, of course, will differ for various products and for various markets. In general, however, consumer studies have indicated preferences for the following items of information, in the order given:

1. Brand name
2. How to use
3. Quantity statement
4. Indication of quality
5. Producer's name
6. Ingredients

The foregoing list assumes that the product name is clearly indicated. The desire for a quality indication



3—Familiar to every housewife, regardless of its form, is the swan which illustrates the brand name of Swansdown cake flour. The famous breakfast cereal, Shredded Wheat, is recognized by the factory illustration imprinted on box.

applies mainly to canned foods, and for such products the reports show that most consumers would like some kind of a grade indication. It is still a matter of debate as to what is the proper method of indicating grade.

The legal requirements are clearly and explicitly stated in the Federal Food, Drug and Cosmetic Act (see p. 99), and this is supplemented by laws passed by the various states. Both should be carefully scrutinized by the packager. Reduced to simplest terms, provision should be made to show the following four required items of information on packages subject to those laws:

1. Product name
2. Quantity statement in certain required terms
3. Name and address of producer or distributor
4. In some cases, statement of ingredients

The laws even cover the matter of language, size of type and place where these items of information must appear. The packager must know those provisions and comply with them.

Once these requirements are met, the door is wide open for the manufacturer to use package surface for many permissible items, provided only that nothing on the package interferes with the legibility or conspicuousness of the required features. Of these permissible points, which ones should be emphasized is a matter to be decided only by a study of the individual product, the retail outlets through which it is sold and its ultimate consumers. Some of these points follow, and the accompanying illustrations show how they have been treated on packages that are familiar to everyone.

Product name—The name of the product may be emphasized, as it often is in the case of cans of fruits and vegetables. Because of lack of national advertising or because the name is not widely known, producers of these products may find it more advantageous for their packages to stress the product rather than the brand name or the name of the manufacturer.

Brand name—A brand name, like "Swansdown," long familiar to every housewife, may be featured without regard to any specialized design, type of lettering or trade-mark.

Trade-mark—A trade-mark, like the "Heinz" keystone, is widely recognized when it appears merely in outline form. It is used on practically every item in the Heinz line, which incidentally numbers many more products than the well-known figure "57." Well-known in the cosmetic field is the "Prince Matchabelli" coronet.

Trade figures—Trade figures, once they are well established, become valuable recognition features. There are many examples—good ones are Walter Baker's Dutch peasant; the Carstairs white seal; the Green Giant of Minnesota Valley Canning Co.

Producer's name—The producer's name often carries great weight, frequently without any other characteristic identity. The name "Whitman" would be recognized anywhere for its appropriate product; the same



4—The trade figure of Baker's Dutch peasant and the Heinz keystone trade-mark are instantly recognized.



5—The producer's name is enough to ensure product identity, if the name is as well-known as "Whitman."



6—Vitamins Plus package displays product ingredients; founders are depicted on Smith Brothers box.



7—Illustration of the product has great merchandising value, particularly for canned foodstuffs.

is equally true of the names "Eastman" and "Ansco."

Founder's portrait—Often the portrait of the founder of a business, whether or not a thing of beauty, becomes so well known that it would be foolish to change the package design. An example is Smith Brothers' Cough Drops, with the famous pair, "Trade" and "Mark."

Product illustration—Sometimes, particularly in marketing merchandise in areas with foreign population, a glorified illustration of the product serves the best purpose. Examples are freely drawn from the field of canned goods. The large red tomato on the label is unmistakable in any language; furthermore, it helps the juvenile shopper who goes to the store for mother.

Recipe illustration—A food product may be usable in a number of recipes, and these may be featured in colored illustrations. General Mills recently redesigned its "Bisquick" packages using this device. A further advantage of this plan lies in the possibility of "changing the copy" as frequently as the company desires.

Product uses—A product like "Clorox," the household disinfectant, may also have a number of unrelated uses. The bottle label is used to illustrate these uses by small but clear line drawings.

Product ingredients—The ingredients of a product, or its component parts, may constitute information of an important character. Such is the case with a product like "Vitamins Plus," of which the constituents supply many deficiencies for the purchaser.

Grade—Indication of the grade of a product can very easily be given prominence. Examples are to be found frequently in the field of canned goods, either in the form of the "U. S. Inspected" shield, or a mere statement of the grade.

Factory illustration—The "Shredded Wheat" package, unchanged in most respects for many years, featured the factory where the product was made. This illustration came to be the equivalent of a trade-mark.

The package insert is another important means, available to the producer, by which additional information may be conveyed to the consumer. In connection with its use, however, it should be remembered that the package insert is regarded by the Food and Drug Administration as a part of the labeling; as such, it is subject to all the provisions applicable to labels and packages. Merchandise in cartons most easily lends itself to this form of promotion, and inserts are used for a number of purposes, among which are:

1. Detailed information about the history of the product and its manufacturers
2. Full instructions regarding use and storage
3. "Other product" advertising
4. Particulars of premium or special offers

The list could be extended almost indefinitely. Users of inserts in packages should give careful thought to the preparation and appearance of this material. Unless it looks interesting and attractive, the purchaser will discard it before it has performed its function.





8—(Left) The numerous dishes which can be made with Bisquick are depicted on the box, along with recipes for their preparation. 9—(Right) This well-known label devotes its back panel to line drawings which illustrate product uses.

Standardization vs. individuality

Is it possible to have a package with individuality and at the same time to enjoy the benefits attendant upon standardization of package sizes and shapes? Is there an irreconcilable conflict between these two principles? This question, which every package planner must weigh carefully, really simmers down to one of external decoration versus structural considerations. Are the two actually opposed to each other?

Time was when the suggestion of standardization met with stony stares or active hostility. But certain values in the principle gained gradual acceptance, and the grim necessities of war brought more progress in standardization. Today it has a definite place in the packaging picture.

Three points of view emerge: those of the designer, the package production executive and the director of sales. Each of these three has vital interests at stake. The observations which follow are representative of these three viewpoints.

The designer's viewpoint

by Egmont Arens

Far from cramping a designer's style, standardization is often an added inducement, a challenge to create something vitally new and different within a limited sphere. Every can on a grocer's shelf, each bottle on a druggist's counter, may be the same size and the same shape. Each label must contain the information demanded by the FDA. And yet, certain packages will stand out above all the others as you scan the shelves.

Standardization is necessary. The can or bottle manufacturer is not in a position to manufacture a container of different size and shape for each and every product. Nor would I, as a designer, want him to do that. For with sufficient imagination the basic tools of color, style and line may be combined into an infinite variety of unusual and outstanding designs. A case in point is the design we did a few years ago for the Iona line of canned fruits and vegetables. The old packages incorporated a statement of the contents against a dull green background. The main characteristic of the design was a cigar store Indian head. It was swell for the murky recesses of a country store but hardly in line with the fast-selling modern background of the A & P store. The packages carried no message other than the description of the product.

After preliminary discussion it was decided that the redesigned package should have high visibility, appetite appeal and dramatization of A & P service. This was accomplished in the following manner: luscious full color sketches of the particular product both as it grows in the garden and in a dish ready for serving, are dramatized against a background of shiny black. It's a lively and conspicuous package suggesting the idea of "from the garden to your table" without actually printing these words.

The old-fashioned Indian head is relegated to the back of the package where it is streamlined to become a trade-mark. Underneath this symbol are printed recipes which have been tested in the A & P kitchens. These act as an added incentive for buying and also as a tie-in to the weekly recipes published in the "A & P Menus."

This new design featuring appetite appeal and incorporating the A & P good service qualities, resulted in a marked sales increase. Yet, the same size can was used and the same product was being sold. The sales increase was not in spite of standardization nor because of standardization. It was caused by studying the sales problem in terms of the product, its setting and the consumer to which it would appeal, and translating these findings into a design that would best answer those needs.

In the case of the Bristol-Myers drug line which we recently redesigned, standardization was almost a basis for working out a simple yet distinctive style that could be easily adapted to an immense variety of standard boxes, vials and ampuls. There is an originality in this design which is striking. It bears no similarity to any other drug line, yet it reflects the "bedside manner" of a good physician. It doesn't shout, it is purely a prescription package, but the color and type will impress themselves on the user's mind. The result is proof that standardization is only one small limitation to the designer and is not considered a problem at all by the designer today.

The production executive's viewpoint

by Edward W. Love

From a production man's point of view, there is no doubt that standardization of packaging—with all that that term embraces—is a "consummation devoutly to be wished." As one by-product of the war, much has already been done toward the standardization of such containers as bottles, cans, jars and even boxes. It probably is not possible, and perhaps not even desirable, for example, to have all one-ounce bottles meet exactly the same specifications as to dimensions and shapes.

Nevertheless, it is certain that standardization within a given plant is definitely desirable and possible, particularly where many products are run on the same production line. Within that given plant there could be set up a maximum range for the essential dimensions of various types of container. This should in no way

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interfere with originality in design or individuality of style; but it would eliminate machine changes from one product to another with consequent high costs paid in delays and slowed-up efficiency. This setting up of standardized dimensions is a real problem calling for the utmost cooperation between sales, design and production departments. As a matter of fact, such standardization could only be brought about through the intelligent cooperation and genuine interest of all departments.

Certain basic principles should guide. For example, any container which merely sets on a conveyor while being filled and closed should have a large base in proportion to its other dimensions. It should also have a low point of gravity. To be sure, many containers of unusual shape, that could not possibly be taken care of on fully automatic lines, can be handled by hand or semiautomatic operations. If a business has any possibility of growth, however, the hand-operated packaging line of today may be the fully mechanized line of tomorrow. Consequently, the forward-looking packaging engineer will make plans to provide for as much standardization as possible.

The use of package inserts or circulars may serve to illustrate this point. While the product output is small, circulars can be inserted in packages by hand without overtaxing the facilities or personnel. But when sales increase and the output load reaches high speed, the machinery and personnel may prove inadequate to handle certain kinds of package inserts. However, careful planning and forethought will anticipate such a growth; from the start, it could be possible to select a maximum or minimum size of insert adaptable to either hand, semiautomatic or fully mechanized operations. The same principle might be applicable in the case of labels. Applied by hand during the early history of a product, some forms of labels would be completely outgrown as the business increases. But if a careful selection is made of design and shape during the early stages, it will be found possible to retain the original—because of standardization—when high-speed production becomes necessary.

No product container is more standardized than a No. 2 can for peas. Yet the design treatment has made this a package unlike any other on the market.

PHOTO, COURTESY EGMONT ARENS



The sales executive's viewpoint

by George L. Mentley

From the viewpoint of sales and distribution, standardization of package sizes means decided advantages—provided the principle is not carried too far or pushed in the wrong direction.

As to external appearance, it is perfectly possible to attain individuality even though the container may be a stock size and shape. We use bottles, metal cans and wrapped cartons for our products, all more or less standardized, and we rather pride ourselves on having packages of distinctive appearance.

But standardization goes deeper than appearance. It has aspects—important from the standpoint of merchandising and distribution—that affect consumer, retailer, jobber and to some extent the carrier. There are general principles involved that will apply to any business, although I shall of course deal with them as they apply specifically to our business.

The ultimate consumer of our goods thinks in terms of quality and quantity but she relates quantity to a given number of servings at a given price. She buys a familiar type of container which to her is a standard. Certain deviations from the familiar standard are reflected in reduced sales. Example is afforded by the case of a manufacturer of dehydrated soups who introduced his product in a flexible container at a time when metal was forbidden him. The product itself became popular in that package—the package became a sort of standard. When metal containers were again permitted, he adopted a small-sized tin can for his dehydrated soup, affording really better protection at no increased cost. But the consumer would have none of it; she had bought liquid soup in a standard No. 1 can, and she had bought dehydrated soup in a package that had quickly become a standard. The little can resembled neither—and sales fell off.

The retailer wants standardization. He has certain facilities and equipment, and he has certain habits and practices that govern storage and display. Packages should be standardized to the point where they meet the requirements of those facilities and practices. For example: frozen food packages must be of such a size that they are adapted to the refrigerator cabinets in which the retailer has a considerable investment.

The jobber, too, is interested in standardization. Bulk packages should be standardized, so far as the number of consumer units contained is concerned, in the interests of economical and efficient handling. At present there is a lack of uniformity. Consumer units of frozen foods are packed in cases of two dozen, four dozen and six dozen. The two-dozen unit would be an advantageous standard, as for many retailers it is their unit of purchase. If a packer uses the larger bulk containers, it results in broken case sales which are not the most economical method of handling. For the carrier, too, the two-dozen standard would afford more convenient handling and perhaps result in less damage.

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A CHECK LIST FOR

I. PRODUCT CHARACTERISTICS

A. What is the physical form—

1. Powder?
2. Granular?
3. Solid?
4. Viscous?
5. Oily or greasy?
6. Liquid?
7. Gaseous?

B. What protection will it require—

1. Water-vapor condition or requirement
   a) At time of manufacture?
   b) At time of use?
   c) Under marketing conditions?
2. In production or in shelf life does it face hazards due to action of—
   a) Light?
   b) Thermal changes?
   c) Bacteria?
   d) Mold?
   e) Corrosion?
   f) Insect infestation?
   g) Rodents?
   h) Pilferage?
3. Do the seals on the package material give the same protection as the package material?
4. If contents are not used after opening package, is re-closure needed to protect unused portion?
5. How do product and package material react chemically with respect to each other?
6. Will package prevent loss of—
   a) Aroma, flavor or volatile components?
   b) Color?
   c) Physical shape? (breakage of tablets, etc.)
7. Will package prevent ingress of—
   a) Foreign odors?
   b) Oxidation or other chemical reactions?

II. SELECTING PACKAGE MATERIAL

A. Is it appropriate?

1. In structural strength, is it consistent with usage for which it is intended?
2. In "producibility," will it lend itself readily to the processes of fabricating, graphic arts, etc., that give it form and identity?
3. Is it a material which is familiar to consumers in form, shape, texture and therefore suitable; or will it require "selling"?

B. Is it structurally adequate?

1. Will it go through mechanized production at high speeds?
2. Can it withstand extremes of temperature and/-or refrigeration conditions in carriers?
3. Will it stand up under storage conditions in warehouses and retail stores?
4. If vacuum, gas or hermetic packing is required, is package structure most advantageous for such equipment?
5. If necessary, can package and contents be sterilized?

C. Is it available?

1. Is a reasonably steady supply assured?
2. What is the time of delivery dates?
3. Are prices subject to fluctuation?
4. Are prices in line with this particular purpose?
5. Have you checked all possible sources of supply?

III. PRODUCTION CONSIDERATIONS

A. Equipment

1. Can package be formed, filled, and closed on existing equipment or will new equipment be required?
2. Would it be advisable to change package sizes or forms (and selling prices) rather than to buy new equipment?
3. Would modifications in package structure make it possible or advisable to utilize new types of equipment to good advantage in speed, efficiency or economy?
4. If code marking is needed, is method provided?

B. Personnel

1. Will the package involve standardized operations, or will it require special personnel?
2. Does this package impose unusual difficulties with respect to breakage, inspection, etc.?
3. Will operations be fully mechanized, semiautomatic, or mainly hand?

C. Design

1. Is container of right size and shape to move properly through packaging machines and on conveyor lines at required speeds?
2. Is the closure suitable for product and production, as well as serving consumer convenience?
3. Are openings adapted to filling devices?
4. If labeling operations are required, are there suitable label spaces or surfaces?
5. Is the design "engineered" for greatest shock resistance in machine handling?
6. Does the design permit of proper storage and shipment?

(Page 88)

PACKAGE PLANNING

IV. CONVENIENCE FACTORS

A. In preparation, prior to use:

1. Does fabrication involve standard practice, or are unusual methods and equipment required?
2. Can packages be shipped and stored conveniently prior to delivery to the production line?
3. If there are several parts to the packaging materials, can the component parts be conveniently and easily assembled for packaging?
4. Can the package be adapted conveniently for shipment to user by manufacturer or fabricator in final shipping cases? (e.g., shipment of glass bottles by glass manufacturer in cases again used to ship filled containers.)
5. Does the package have proper weight or capacity in relation to bulk container?

B. In production:

(See "Production Considerations," above)

C. Packing and shipping considerations:

1. Is there an accepted method for packing goods of this character for shipment? Can that method be used?
2. Is the unit package properly adapted for convenient bulk packaging?

D. In distribution channels:

1. Is the package of proper size and shape for convenience of wholesaler and retailer?
2. Is the package convenient for a) storage, b) display, and c) sales handling and delivery?

E. In the hands of the consumer:

1. Is the unit package the proper size for consumer?
2. Should package provide for inspection of contents prior to sale?
3. Can the package be opened easily and, if necessary, effectively closed for further use?
4. Could a dispensing device (such as a pouring spout, etc.) be used effectively?
5. Can consumer measure out correct quantity conveniently?
6. Is there a disposal problem?
7. Is there a re-use possibility for empty containers?
8. Has consumer convenience been considered in matter of hand grip features, ease of grasping, dispensing, etc.?
9. Is package size appropriate and convenient for a) refrigerator, b) pantry shelf, c) bathroom cabinet or other consumer storage place?

V. CONSIDERATIONS OF ECONOMY

1. Does package use minimum of material consistent with proper packaging policy?
2. Does package comply with standardization practices that make for economy in a) manufacture, b) production and c) handling?
3. Is container cost in proper proportion with—
   a) Unit price of product?
   b) Available margin for packaging cost?
   c) Market desired?
   d) Class of merchandise being packaged?
4. Does price paid for packaging material ensure a low percentage of defects?
5. With real economy in mind, does the package provide protection for normal life of product, plus a reasonable margin of safety?
6. In weight, size, and structure, does package lend itself to economy in shipping?
7. Does the "cheapness" or "expensiveness" of the package make the desired impression on the purchaser?

VI. MERCHANDISING CONSIDERATIONS

A. The product:

1. Is this a new product?
2. What—how many—are its uses?
3. What is its relative quality in its line?
4. What are the special sales points or features?

B. The market:

1. Who are the ultimate consumers—
   a) Age
   b) Sex
   c) Income bracket
   d) Social or cultural levels
   e) Races—geographical locations
   f) Export markets
2. The distribution plan—
   a) Regular channels—wholesale and retail:
      (1) Independent stores
      (2) Chain stores
      (3) Self-serve or super markets
   b) Mail order
   c) Direct selling (house-to-house)

C. Buying habits:

1. What are the retailer habits or practices with respect to products of this character—
   a) Unit of purchase?
   b) Storage prior to placing on sale?

(Page 89)

c) Display on shelf, counter or window?
   (1) Is shape and size of package adapted for mass display?
   (2) Is single unit attractive?
   (3) Will package be seen above and below eye level? Which panel displayed?
   (4) Will the retailer support the product?
   (5) Will supplementary or point-of-sale support be given?

D. Size considerations:

1. Are package sizes properly adapted to—
   a) Distribution methods?
   b) Consumer habits?
2. How would changes of package size affect—
   a) Consumer convenience?
   b) Quantity of purchase or use?

E. Competition:

1. Have you compared product itself with competition, direct and indirect?
2. Have you compared packages—
   a) Material used?
   b) Sizes and shapes?
   c) Colors and designs?
   d) Features—desirable or undesirable?
3. Have you considered whether your package should resemble competing packages, or be distinctively individual—from viewpoint of a) manufacturer, b) retailer, c) consumer?

VII. FACTORS OF PACKAGE APPEARANCE

A. For identity:

1. Are all features present which ought to appear, and are they treated properly with respect to relative position and emphasis?
2. Is brand name unmistakable as to position and style?
3. Does the package adequately feature a familiar trade name?
4. Is name of manufacturer given due prominence?
5. Is product name (as distinguished from brand) featured so as to afford immediate product identity?
6. Does it—or should it—use a "family" design?
7. Does the package appearance reflect—
   a) The outstanding qualities of the product?
   b) Integrity and responsibility of maker?

B. For information:

1. Does the package carry all information required by law, and in a manner acceptable for Federal, State and foreign distribution?
2. Are instructions and uses legible and easy to understand?
3. Is it possible to clarify—shorten—or improve—the directions or instructions?
4. Do the illustrations serve to a) instruct, b) interest, and/or c) attract the consumer?
5. Should a blank price panel be provided for dealer use?

C. For inviting attention:

1. Are colors and design—
   a) In good taste?
   b) Appropriate for product, retail outlet and consumer?
   c) Compare favorably with competition?
2. Does the package make a pleasing impression—
   a) From a distance?
   b) From a closer view?
   c) On shelf, counter or in window?
   d) In the consumer's home?
3. Does it carry a self-selling story?
4. Have all the pros and cons of visibility package material been weighed?
5. Does the package have remembrance or reminder value?
6. Is the package a self-sufficient advertising unit, or must it depend on other forms of advertising media?

VIII. COORDINATION IN PLANNING PACKAGES:

A. From the internal point of view:

1. Have you sought the cooperation of various departments—
   a) Product development
   b) Market research
   c) Purchasing
   d) Production
   e) Legal
   f) Sales
   g) Advertising
   h) Art
2. In respect to package size, appearance and structure, have all possible conflicts been compromised?
3. Have the complete specifications for this package—exact color identity, dimension, special fabrication instructions, and all possible sources of supply, been put into permanent form for future reference?

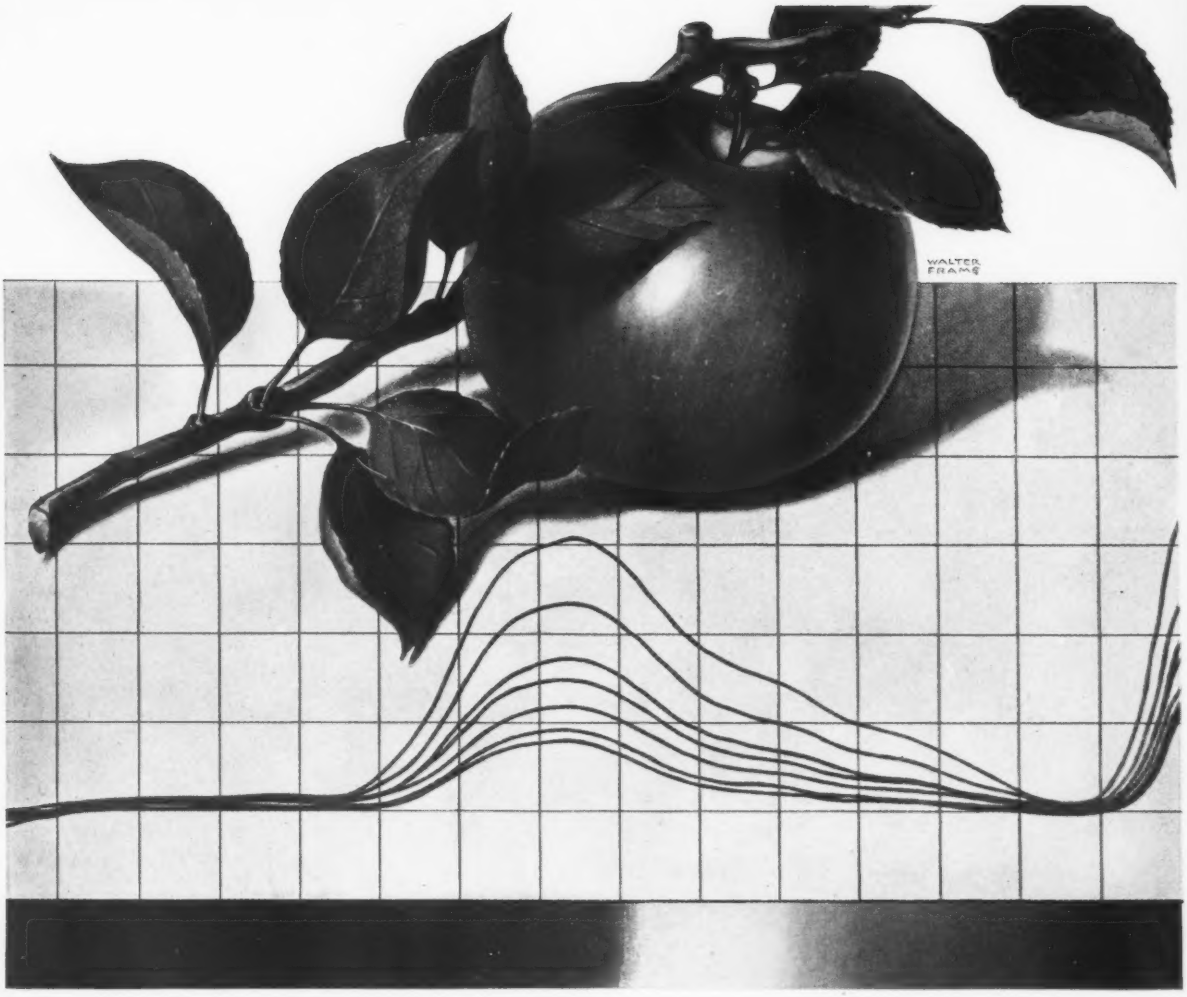
B. External considerations:

1. Have you taken all possible steps to ascertain dealer attitudes?
2. Are you fully satisfied there will be, or that there can be developed, a reasonable consumer acceptance for this product and package?

(Page 90)

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ADVERTISING FOR PACKAGE DEVELOPMENT



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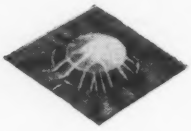
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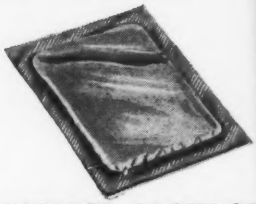
3 *Basic Types of* UNIT PACKAGING



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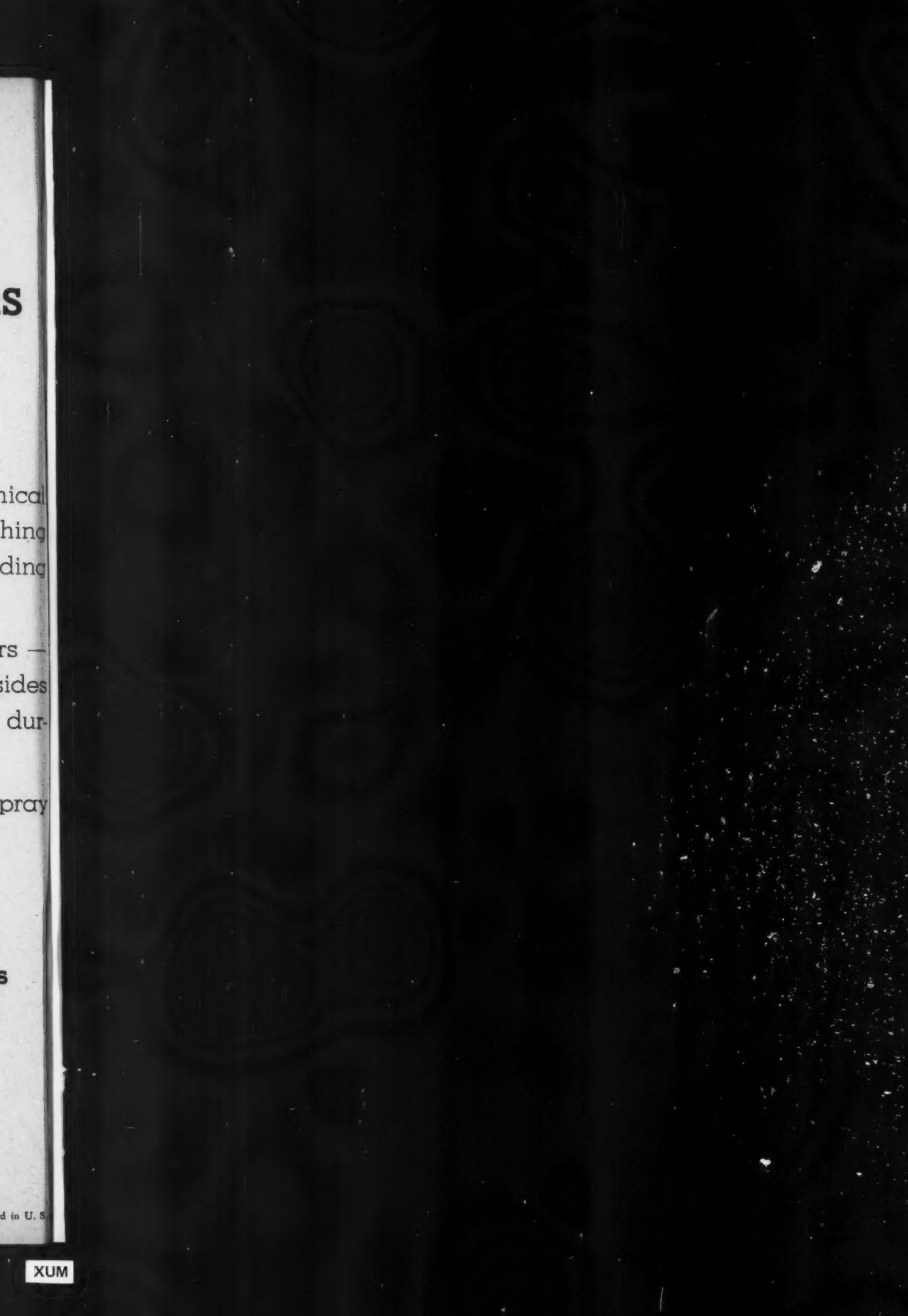
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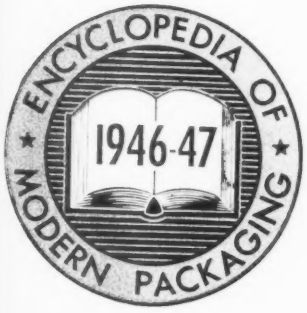
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LEGAL AND GOVERNMENTAL CONSIDERATIONS



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Legal protection of packages

Package structures, if "new and useful inventions," may be protected by patent. Package designs may be protected by design patent. Trade-marks may be protected by registration, both Federal and state. Designs of labels, cartons, displays, etc., may be protected by copyright.

Package construction patents are issued by the United States Patent Office for a term of 17 years with renewal provisions. Design patents may be obtained for terms of $3\frac{1}{2}$, 7 or 14 years, at varying fees. Federal trade-mark registration is obtained from the United States Patent Office, and information about registration in various states may be obtained from the Secretaries of State.

It would be very unfortunate if the foregoing terse statements created an impression of false security or undue simplicity.[1] Those who are concerned with protecting package structure or appearance should seek the guidance of a competent attorney, well informed on trade-mark and patent law, in both the domestic and foreign fields.

It is true that in the United States the ownership of a trade-mark depends primarily on use, and only secondarily on registration, but the protection of the first user is not automatic; that is, the Government, of its own initiative, will take no steps to halt an infringer of a patent or trade-mark. It is incumbent upon the owner of the infringed patent or trade-mark to bring suit in the Federal courts.

One trade-mark expert[2] points out that: "There is no single subject more confusing to the commercial world than that of trade-marks. . . . Registration and copyright laws are for the purpose of preserving investments and to protect the public, never to aid and abet in circumventing these purposes, or to create any unfair advantages.

"If you cling to the threadbare notion that the so-called Common Law is ample security, you may awaken to the fallacy of poor economy in disregarding the other fellow until complications arise.

"If you seek the utmost freedom in trade-mark promotion throughout the United States, you must take the available precaution to block infringement entrance from foreign ports.

"If you attempt to adjust conflicts directly with competitors, you may wind up further away from a satisfactory outcome than you were when you started negotiations.

"If you are incorporated and omit to have the Corporate Charter made a part of the record in the proper archives of the Patent Office, you overlook a major protective opportunity.

"If you do not clearly distinguish 'registration' from 'copyright' and the various forms of these separate protection mediums, you may discover too late that you purchased the wrong article.

"If you have a registrable trade-mark and fail to have it registered under the Federal statute, others may register and pose as the original owners—the burden of proving otherwise falls upon you.

"If you register Federally without registering in the states of interest, you may find the trade-mark registered by local claimants in one or all of the 48 states and face heavy outlays of numerous cancellation suits.

"If you export branded products without registering abroad, you invite losing the markets should others register in the foreign countries having laws that strongly favor the registrant.

"If you have an attractive label or container and fail to obtain copyright within a reasonable time after its first production, you will be denied a valid copyright.

"If you have private brands, registered or unregistered, and fail to guard them by constant supervision and competent counsel, you may experience the disappointment of finding that the brands have become more public than private in various sections."

Part of the confusion with regard to brand names is due to the misconception that ordinary words in the English language cannot be registered as trade-marks. Hugo Mock, counsel for the Toilet Goods Association, calls attention to the fact that: "There is no rule against the registration of ordinary words as trade-marks, but generally, geographical and descriptive terms are unregisterable." (The name "Rose" Brand could not be registered for perfumes but would be a possible trade-mark for millinery or stationery.)

"Even descriptive and geographical terms can be registered as trade-marks under the Act of March 19, 1920, where the user has had exclusive use of same for more than one year. For instance, words such as 'Oklahoma' or 'Arizona' are clearly geographical terms but if no one has competed with the originator of 'Oklahoma' perfumes for one year, the user of that mark could secure a limited registration under the Act of March 19, 1920."

Because—as has already been pointed out—ownership of a trade-mark depends upon priority of use, there are many trade-marks in use which have not been registered in the Federal Patent Office or in the various states. Ownership of a mark begins with its actual use in commerce and there is no ownership of any trade-mark apart from such use. This fact is responsible for the common custom of establishing priority of use by actual commercial shipments of the trade-marked merchandise into territories where the manufacturer expects to do business.

[1] See also *Proposed Changes in Trade-mark Law*, p. 116.
[2] Lee W. Mida, Mida's Trade Mark Services.

Governmental regulation of packaging

Most important single law affecting packaging is the Federal Food, Drug and Cosmetic Act of 1938. Between 70 and 80 per cent of all packages on the market contain products in the three classes coming under its jurisdiction.

Purpose—Chief function of the Food, Drug and Cosmetic Act is the protection of the consumer. This involves safeguarding public health and protecting the consumer from packaging which is misleading as to quantity or nature of contents. Scarcely less important is the function of the act in protecting the legitimate operator from the unfair competition which may result from deceptive packaging.

History—The 1938 Food, Drug and Cosmetic Act is the most recent of a series of Federal enactments which began in 1890 with the passage of a law prohibiting the importation into the United States of any sorts of adulterated or unwholesome foods, drugs or liquors. Successor to the 1890 legislation was the Wiley Act of the year 1906.

First draft of the present law was submitted to Congress in 1933 and, after several revisions and the recording of thousands of pages of testimony, it was passed and signed by the President on June 24, 1938. There were postponements of several of its provisions, but by July 1, 1940, the act was fully in effect.

The Food and Drug Administration, formerly in the Department of Agriculture, was transferred to the Federal Security Agency in 1940. The personnel of the Administration was not changed, however, and the continuity of administrative procedure has been constantly maintained.

Caution—The Food, Drug and Cosmetic Act is a very complex document, made further complicated by the multiplicity of rulings and regulations issued under it. It is impossible, therefore, in a general description of its provisions, to cover every point that may arise in the packaging of any given product. The following sections, however, discuss the more general packaging applications of the act.

Packagers are advised to consult with the local offices of the Food and Drug Administration or with their attorneys before entering into the production of any package, package part or label which might come under the provisions of this act.

Adulteration—Many provisions apply to adulteration of foods, drugs and cosmetics. In most cases these provisions do not affect the packaging operations or the packages themselves, except in so far as the penalty for adulteration involves a confiscation and seizure of packaged products. However, the provisions of the law applying to preparation or holding of foods, drugs or cosmetics under insanitary conditions obviously apply to packaging as well as to processing conditions.

Packaging provisions

Packaging provisions of the act differ slightly in their application to foods, drugs and cosmetics. All three product categories are covered by a provision against packaging under insanitary conditions which may lead to contamination with filth or may render the product injurious to health. All three categories are also covered by a provision against the use of containers composed, in whole or in part, of any poisonous or deleterious substance which may render the contents injurious to health. Failure to conform to either of these provisions constitutes adulteration of the product.

Containers for products in all three categories must not be so made, formed or filled as to be misleading. Products in such containers are subject to the act's penalties for misbranding. The Chief of the Eastern District of the Food and Drug Administration lists these factors which tend to make a package deceptive:

1. Glass bottles
   a) Thick glass
   b) Panels
   c) Excessive height
   d) Indented bottoms
   e) Irregular shapes
   f) Magnifying shapes
2. Opal jars—Same as 1; also raised covers
3. Cardboard, fibre and metal containers
   a) Excessive size (slack-filled)
   b) False bottoms
   c) Indented bottoms
   d) Raised covers
4. All types of containers: oversize cartons
5. Facing
6. Deceptive colored wrappings
7. Excessive wrappings
8. False packing

In any particular instance, it is a question of fact whether or not the container is deceptive. A number of rules or formulas have been proposed to assure compliance with the provisions of the act covering misleading containers. Best known of these is the so-called Bristol formula for the manufacture of cartons in sizes which more nearly fit tubes of tooth paste.

Manufacturers who pack odd-shaped bottles in cartons have been confronted with the possibility of falling under the deceptive packaging provision because the carton fill often falls as low as 25 per cent. Where the bottle itself is not deceptive, some manufacturers have recently endeavored to correct possible deception in the packages by printing a facsimile of the bottle label on the carton exterior. In the absence of court interpretation, the Administration has not objected to this, if the exact size of the bottle is shown.

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Bottle shape and color specifications

Another formula, developed by the State of North Dakota in the enforcement of its state Food and Drug Act, is used for determining whether bottles are deceptive. The formula is intended to contrast the true capacity with the apparent capacity.

North Dakota declared as normal, glass containers appearing $1^1/_2$ times their capacity. That is, if the external volume of the bottles plus the volume of any panels or outside indentation is not more than $1^1/_2$ times the capacity of the bottle, then the containers are considered to be normal. This same rule has been applied also to 2- and 4-oz. glass bottles.

Investigations by the Food and Drug Administration on bottles of larger size indicate that the ratio of apparent size to actual capacity becomes progressively less as the size of the container increases.

The bottle heights set forth below are over-all heights and represent the distance from the extreme top of the bottle (without stopper) to the bottom by outside measurement. The Food and Drug Administrator has tentatively accepted these heights as satisfactory and the figures may be regarded as the respective maximum permissible heights:

CAPACITY	HEIGHT	CAPACITY	HEIGHT
oz.	*in.*	*oz.*	*in.*
$^1/_2$	$3^{13}/_{32}$	2	$4^{29}/_{32}$
$^3/_4$	$3^{21}/_{32}$	3	$5^5/_{16}$
1	$4^1/_{32}$	4	$5^{29}/_{32}$
$1^1/_2$	$4^{15}/_{32}$		

Of course, bottles meeting these requirements as to height may be deceptive for other reasons, as, for example, irregular shape, undue thickness of glass, indented bottoms and panels.

Many types of deception cannot be covered by formula. The shape of an article may throw the package into the deceptive class as, for instance, in the case of chocolate bars which have been excessively thinned out to provide an extremely large ratio of package face to its weight. Deception due to colored wrapping results from the use of transparent colored materials.

Powdered products

Manufacturers have had much difficulty with products which settle after packing, such as spices, talcum powder and tooth powder. A method of measuring the package content of spices, and a minimum content requirement based on the capacity of the container, have been worked out by the American Spice Trade Association. The same requirements are applicable to talcum powder, tooth powder, tea and free-flowing macaroni products, and may later be found to apply to other types of packaged materials. This method provides an informal guiding figure which, if met or exceeded would, in the opinion of the Administration, indicate a satisfactorily filled package for these products. The maximum and minimum volumes occupied by 2 oz. are determined as follows, by the "Spice Method":

To Determine Maximum Volume—Roll 2 oz. of the spice back and forth on a sheet of paper 10 times, fill into 250-cc. graduated cylinder and note volume.

To Determine Minimum Volume—Vigorously tap the 250-cc. cylinder 100 times and read volume; tap 20 times and again read volume; continue till 20 taps reduce the volume less than 1 cc. and note the final volume. To obtain the proper minimum volume where cosmetic powders are concerned, it is necessary to pound the cylinder vigorously rather than tap it.

The average volume for any given weight of spice is obtained by direct proportion, using the average of the maximum and minimum volumes of 2 oz. obtained as indicated above. The per cent of fill is calculated from the average volume occupied by the spice and from the capacity of the container; for example, if the average volume occupied by the spice is 90 cc. and the container has a capacity of 100 cc., then the per cent of fill is 90 per cent.

Provisions affecting labeling

The terms "label" and "labeling" are not used synonymously in the act. The term "label" is defined as a display of written, printed or graphic matter upon the immediate container of any article. A requirement that any word, statement or other information appear on the label shall not be considered to be complied with, unless such information also appears on the outside container or wrapper of the retail package or is easily legible through the outside container or wrapper. The term "labeling" means all labels and other written, printed or graphic matter upon any article or upon any of its containers or wrappers, or accompanying it. (See *Labels, Seals, Tags and Marking Pieces*, p. 287.)

Exemptions—An exemption from certain labeling requirements of the act is provided under certain conditions for cosmetics which are to be processed, labeled or repacked in substantial quantities at establishments other than those where originally processed or packed, provided that such cosmetics are not adulterated or misbranded upon removal from such processing, labeling or repacking establishments. A similar exemption applies to drugs and foods. Small open containers of fresh fruits and fresh vegetables are also exempted by regulations from certain Federal labeling requirements.

Food-labeling provisions

The food-labeling provisions of the act may be summarized in 12 rules—two in the form of prohibitions and 10 in the form of affirmative requirements:

1. The labeling of a food must not be false or misleading in any particular.
2. A food must not be offered for sale under the name of another food.
3. The label of a food which is an imitation of another food must bear, in type of uniform size

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THE FEDERAL FOOD, DRUG & COSMETIC ACT

ADMINISTRATOR OF THE FEDERAL SECURITY AGENCY

Paul V. McNutt

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and prominence, the word "imitation" and, immediately thereafter, the name of the food which is imitated.

4. A food in package form must bear a label containing the name and address of the manufacturer, packer or distributor.
5. A food in package form must bear a label containing an accurate statement of the quantity of the contents in terms of weight, measure or numerical count. Reasonable variations are permitted and exemptions as to small packages shall be established by regulations.
6. If a food purports to be or is represented as a food for which a definition and a standard of identity have been prescribed by regulations its label must bear the name of the food specified in the definition and standard and, in so far as may be required by such regulations, the common names of optional ingredients (other than spices, flavoring and coloring) present in such food.
7. If a food purports to be or is represented as a food for which a standard of quality has been prescribed by regulations and its quality falls below such standard, its label must bear, in such manner and form as the regulations specify, statement that it is below standard.
8. If a food purports to be or is represented as a food for which a standard or standards of fill of container have been prescribed by regulations and it falls below the standard of fill applicable thereto, its label must bear, in such manner and form as the regulations specify, a statement that it falls below standard.
9. A food which does not purport to be one for which a definition and a standard of identity have been prescribed by regulations must bear on its label the common or usual name of the food, if any there be, and, in case it is fabricated from two or more ingredients, the common or usual name of each such ingredient. Spices, flavorings and colorings, other than those sold as such, may be designated without naming each. Exceptions may be established by regulations to the extent that naming of the ingredients is impracticable.
10. If a food purports to be for special dietary uses, its label must bear information, prescribed by regulations, concerning its vitamin, mineral and other dietary properties.
11. If a food contains any artificial flavoring, artificial coloring or chemical preservative, it must bear labeling stating that fact. To the extent that compliance with this requirement is impracticable, exemptions shall be established by regulations. The requirements with respect to artificial coloring do not apply in the case of butter, cheese or ice cream.
12. Any word, statement or other information required by the act to appear on the label or labeling must be prominently placed thereon with such conspicuousness (as compared with other words, statements, designs or devices in the labeling) and in such terms as to render it likely to be read and understood by the ordinary individual under customary conditions of purchase and use.

Drug-labeling provisions

The provisions relating to labeling of drugs and devices fall within 14 rules, four constituting prohibitions and 10 constituting affirmative requirements:

1. The labeling of a drug or device must not be false or misleading in any particular.
2. A drug must not be an imitation of another drug.
3. A drug must not be offered for sale under the name of another drug.
4. A drug or device must not be dangerous to health when used in the dosage or with the frequency or duration prescribed, recommended or suggested in the labeling thereof.
5. A drug or device in package form must bear a label containing the name and address of the manufacturer, packer or distributor.
6. A drug or device in package form must bear a label containing an accurate statement of the quantity of the contents in terms of weight, measure or numerical count. Reasonable variations shall be permitted and exemptions as to small packages shall be established by the proper regulations.
7. A drug which is for use by man and contains any quantity of the narcotic or hypnotic substances named must bear on its label the name, and quantity or proportion of such substance or derivative, and, in juxtaposition therewith, the statement, "Warning—May be habit forming." The substances named are alpha-eucaine, barbituric acid, beta-eucaine, bromal, cannabis, carbromal, chloral, coca, cocaine, codeine, heroin, marijuana, morphine, opium, paraldehyde, peyote, sulphonmethane and any chemical derivative of any such substance, which derivative has been designated by regulations as habit forming.
8. The label of a drug which is not designated solely by a name recognized in an official compendium must bear the common or usual name of the drug, if such there be, and in case it is fabricated from two or more ingredients, the common or usual name of each active ingredient, including the quantity, kind and proportion of any alcohol and also including, whether active or not, the name and quantity or proportion of any bromides, ether, chloroform, acetanilid, acetophenetidin, amidopyrine, antipyrine, atropine, hyoscine, hyoscyamine, arsenic, digitalis glucoside, mercury, ouabain, strophanthin,

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strychnine, thyroid or any derivative or preparation of any such substance contained therein. To the extent that compliance with requirements is impracticable, exemptions shall be established.

9. The labeling of a drug or device must bear adequate directions for use, provided that where the requirement as applied to any particular drug or device is not necessary for the protection of public health, the Administrator shall promulgate regulations exempting such item from such requirement.
10. Where necessary for protection of users, the labeling of a drug or device must bear adequate warnings against use by children or in those pathological conditions where its use may be dangerous to health, and against unsafe dosage or methods or duration of use or application.
11. If a drug purports to be a drug the name of which is recognized in an official compendium, it must be packaged and labeled as prescribed therein, provided that the method of packing may be modified with consent of the Administrator. Whenever a drug is recognized in both the *U. S. Pharmacopoeia* and the *Homeopathic Pharmacopoeia of the United States*, it is subject to the requirements of the *U. S. Pharmacopoeia* with respect to labeling, unless it is labeled and offered for sale as a homeopathic drug, in which case it is subject to the provisions of the *Homeopathic Pharmacopoeia of the United States* instead.
12. The label of a drug which has been found by the Administrator to be liable to deterioration must bear a statement of precautions required by regulations as necessary for the protection of the public health.
13. A drug which purports to be or is represented as a drug the name of which is recognized in an official compendium, if its strength differs from, or its quality or purity falls below, the standard set forth in such compendium, must plainly state on its label its difference in strength, quality or purity from such standard.
14. Any word, statement or other information required to appear on the label or labeling must be prominently placed thereon with such conspicuousness (as compared with other words, statements, designs or devices in the labeling) and in such terms as to render it likely to be read and understood by the ordinary individual under customary conditions of purchase and use.

In the Fall of 1945, new drug labeling regulations went into effect. Under provisions of these regulations, if a medicine is not safe for self-medication or cannot be satisfactorily used except under supervision of a physician, the label must bear only the Rx legend and must not contain any directions for use or dosage. The responsibility for placing adequate directions on labels now rests with the manufacturer, not the druggist.

Cosmetic-labeling provisions

Cosmetic-labeling provisions fall within five rules:

1. The labeling of a cosmetic must not be false or misleading in any particular.
2. A coal-tar hair dye which may be injurious to consumers under the conditions of use prescribed in the labeling or under usual conditions of use must bear the following conspicuously:

   Caution: This product contains ingredients which may cause skin irritations on certain individuals and a preliminary test according to accompanying directions should first be made. This product must not be used for dyeing the eyelashes or eyebrows; to do so may cause blindness.

   The labeling of such hair dye must bear adequate directions for such preliminary testing.
3. A cosmetic in package form must bear a label containing the name and place of business of the manufacturer, packer or distributor.
4. A cosmetic in package form must bear a label containing an accurate statement of the quantity of the contents in terms of weight, measure or numerical count. Reasonable variations shall be permitted and exemptions as to small packages shall be established by regulations.
5. Any word, statement or other information required to appear on the label or labeling must be prominently placed thereon with such conspicuousness (as compared with other words, statements, designs or devices in the labeling) and in such terms as to render it likely to be read and understood by the ordinary individual under customary conditions of purchase and use.

Labeling coal-tar colors

Labeling requirements for certified coal-tar colors are found partly in the Food, Drug and Cosmetic Act, partly in regulations for coal-tar colors. Labels for all such products should carry:

1. An accurate statement of the net contents of the package, except certain small packages specifically exempted under secs. 403 (e), 502 (b) and 602 (b) of the act
2. The name and address of the manufacturer, packer or distributor
3. In the case of mixtures for use in food, the names of the component colors and of each diluent contained in the mixture, or, in place of the individual color names, the statement "Certified Coal-Tar Color" (or "Certified Coal-Tar Colors"), the common name of each diluent being required in either case
4. The name of the color
5. The lot number of the batch
6. The pure dye content of the color
7. In the case of a color certified for a limited use, a statement setting forth this limitation

Enforcement

The Food and Drug Administration is armed with numerous powers to secure the enforcement of provisions and prohibitions contained in the act. Violation of the prohibitions such as the introduction into interstate commerce of adulterated or misbranded foods, drugs or cosmetics is a misdemeanor under the law. The penalty for such violation is imprisonment for not more than one year or a fine of not more than $1000, or both. Second offenders are liable to imprisonment for not more than three years or a fine of not more than $10,000. Where intent to defraud or mislead is found, a penalty of three years imprisonment or $10,000 fine, or both, may be imposed.

The Administration is empowered to proceed against merchandise as well as against persons. Articles that are adulterated or misbranded and introduced into interstate commerce are liable to seizure by the Administration and, if found by the courts to be adulterated or misbranded, may be disposed of by destruction or sale.

Such drastic proceedings, however, are not undertaken in most cases. The law provides that nothing in the act shall be construed as requiring the Administration to report for prosecution or to institute libel or injunction proceedings where minor violations of the act are concerned, provided the Administration believes that suitable written notice or warning will be adequate.

Economic consequences—Far more important to the average manufacturer than the punitive provisions of the act is the fact that failure to conform to the packaging and labeling provisions and consequent action by the Administration may involve the manufacturer in a whole series of extremely expensive package changes and may involve the loss of dealer good will, adverse publicity and a dislocation of production.

State laws

The state legislatures, through their inherent police powers, as well as through their Constitutional powers involving the protection of public health and the like, have the undoubted right to pass legislation to protect the public against adulterated and misbranded foods, drugs and cosmetics. The validity of state laws is affected by Federal laws only when the two conflict.

Forty-seven states have laws relating specifically to packaging, labeling, adulterating or misbranding. However, the nature of these statutes differs considerably in the various states. A number of states have laws which follow closely the substantive provisions of the Federal Food, Drug and Cosmetic Act of 1938. Among these states are California (no cosmetic sections), Connecticut, Florida, Indiana, Louisiana, Missouri, Nevada, New Jersey, New York, North Carolina, Oregon (food sections only), Tennessee, Virginia and Washington. The Territory of Hawaii and Puerto Rico have similar laws.

Other states have separate laws for foods, drugs and/or cosmetics, and some states have special statutes covering dairy products. These include Alabama, Arizona, Arkansas, Colorado, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Mexico, New York, Rhode Island, Virginia and the Dakotas.

A number of states have special laws or regulations on container packages, labels, weights and measures. These include Arizona, Delaware, Florida, Illinois, Iowa, Kansas, Maine, Massachusetts, Montana, New Jersey (beverage container law), North Carolina, Ohio, Pennsylvania, South Dakota, Texas, Washington, Virginia, West Virginia and Wisconsin.

Oregon, Texas and, since 1945, Hawaii have laws which affect packaging of insecticides and fungicides.

1945 state legislation

In the field of state regulation of packaging, the outstanding achievement during the past year was the widespread passage of state legislation standardizing capacity of containers for flours and meals.[1] Sponsored by the Millers National Federation and recommended by the Council of State Governments, this legislation will perpetuate WPB's temporary nationwide standardization of flour containers. Thirty-three states have adopted the uniform law. Only three—Mississippi, Louisiana and Virginia—still have conflicting statutes.

Other 1945 state action affecting packaging included the following legislation: New York enacted a law requiring that containers of olive oil mixtures be labeled "compound oil" or "blended oil" and bear statement of kind and percentage of each ingredient. New York also passed a law regulating the capacities of containers for frozen desserts, and re-enacted legislation concerning kosher meat, including a prohibition against misleading use of the term on packages containing non-kosher meat. In 1945 Wisconsin amended a law relating to milk containers. Florida passed a weights and measures law, which includes a provision requiring appearance of net contents statements on packages and a prohibition against misleading containers. A new Hawaiian law affects labeling of agricultural seed containers. Nevada passed a weights and measures law.

Usually, state laws and local ordinances are designed principally to cover products manufactured within the state and sold only within the state (i.e., products outside the reach of the Federal authorities). However, they usually apply to foods, drugs or cosmetics *sold* within the state whether or not the product is manufactured within that state.

Thus manufacturers are obliged, in planning new packages, to consider the effect upon package design, label and structure not only of the Federal statute, but also of the laws of the states in which the product is to be sold. State requirements, however, cannot relax Federal restrictions in any respect since the latter prevail throughout the United States.

[1] W. F. Janssen, "Fixed Flour Sizes," MODERN PACKAGING XIX, No. 4 (December, 1945), p. 96.

Special federal regulations

In addition to voluntary observance of such principles as sales appeal and protection of the product, the packager must abide by certain packing and labeling regulations designed for the protection of those persons who might be injured by the product or misled as to its nature. These regulations are laid down by the Government and by certain semiofficial organizations representing such groups as the railroads or freight carriers. Aside from those prescribed in the Food, Drug and Cosmetic Act (see p. 99), the most important of the Government regulations are those discussed below.

Postal regulations

The Post Office Department has prescribed regulations as to the preparation, wrapping and packing of parcel-post or fourth-class mail matter. These regulations are contained in *Circular 3* of the Division of Letters and Miscellaneous Mail, available from any postmaster, and in a circular issued by the Second Assistant Postmaster General, entitled *Preparation, Wrapping and Packing of Mail Matter.*

Examination—Fourth-class matter must be so packed that the contents may be examined easily by postal officials. Otherwise first-class postage is required.

Nailed boxes—Parcel-post mail may be enclosed in boxes if the box lids can be readily removed with a chisel or screw driver for examination of contents.

Containers and packing—All matter must be securely packed and wrapped, or packed in a strong container.

Containers previously used for shipping high explosives having a liquid ingredient (such as dynamite) must not be used for shipment of any article by parcel post. Containers which have been used for the shipment of other high explosives must have all marks removed before shipment by parcel post.

Harmful articles not absolutely excluded from the mails, but which, from their form or nature, might, unless properly secured, damage the contents of the mail bag or harm the persons of postal employees, may be transmitted in the mails only when packed in accordance with the postal regulations.

Pyroxylin (cellulose nitrate) plastics, in sheets, rods or tubes, must be packed in strong sparkproof wooden boxes, and to each parcel must be attached the diamond-shaped yellow caution label fully described in Section 588 of Postal Laws and Regulations. As exceptions to the above, pyroxylin sheets in packages not exceeding $1/2$ in. in thickness may be packed in containers made of two thicknesses of strong double-faced corrugated fibreboard, and small quantities may be shipped in strong strawboard tubes lined with 0.002-in. single-faced corrugated strawboard.

Admissible liquids and oils in packages not exceeding the limit of weight of fourth-class matter will be accepted for mailing when intended for delivery at the office of mailing, or on a rural route starting therefrom, when enclosed in securely closed containers, provided it is not necessary to ship by steam or electric railways.

Admissible liquids and oils, pastes, salves or other articles easily liquefiable shall be accepted for mailing, regardless of distance, when they conform to the conditions prescribed by Section 590, Postal Laws and Regulations, which may be consulted at any post office.

Mailable liquids in tightly closed metal containers in quantities of 1 gal. or more shall be accepted for mailing when suitably boxed or crated to be dispatched outside of mail bags and labeled: "Fragile—liquid. This side up." When liquids are in extra-strong metal containers, the boxing or crating may be omitted.

Fragile articles—Articles easily broken must be securely packed in wooden or strong double-faced corrugated fibreboard boxes with ample cushioning material of excelsior, crushed paper or the like completely surrounding each article to prevent damage. All such parcels must be labeled "Fragile."

Perishable articles must be marked "Perishable," and it is advisable that they be sent as special-delivery matter. Articles likely to spoil within the time reasonably required for transportation and delivery will not be accepted by post office authorities for mailing.

Unmailable matter—All matter is unmailable which is harmful, such as poisons, explosives and corrosives.

Further information may be obtained from:

Third Assistant Postmaster General, Division of Letters and Miscellaneous Mail: for rules on the classification and admissibility of matter as parcel-post mail, rates of postage, limits of weight and size, manner of addressing, manner of wrapping to permit examination, permissible enclosures and additions, attaching communications to parcels, and for copies of *Circular 3.*

Third Assistant Postmaster General, Division of Registered Mails: for rules on the insurance, C.O.D. (including demurrage charge) and registry.

Second Assistant Postmaster General, Division of Railway Mail Service: for rules on the admissibility to the mails and wrapping and packing of matter which from its form or character would be liable to injure the mails or the persons of postal employees.

Liquor packages and labels

The Alcohol Tax Unit of the Bureau of Internal Revenue of the Treasury Department of the United States is charged with the administration of laws and regulations concerning distilled spirits, wines, fermented malt beverages, cereal beverages, industrial alcohol and related products. Under these regulations,

the Bureau controls the size, marking, use and re-use of containers designed or intended for use for the sale and resale of distilled spirits. The regulations governing alcoholic beverages are many and varied.

For sale by the Superintendent of Documents, Washington, D. C., are pamphlets covering these regulations:

No. 3.[1] Distilled Spirits, Bulk Sales, Bottling (5¢)
No. 5.[1] Labeling, Advertising Distilled Spirits (10¢)
No. 6. Bottling of Distilled Spirits in Bond (10¢)
No. 7. Wine (45¢)
No. 11. Bottling of Tax-paid Distilled Spirits (10¢)
No. 13. Traffic in Containers of Distilled Spirits (5¢)
No. 15. Rectification of Spirits and Wines (20¢)

To local District Supervisor, Alcohol Tax Unit, Bureau of Internal Revenue, should go requests for:

No. 4.[1] Labeling and Advertising of Wine
No. 7.[1] Labeling and Advertising of Malt Beverages

On the wine brand label—The following information is required:

1. Brand name
2. Class and type
3. Name and address of bottler or importer, preceded by the phrase "Bottled by" or "Imported by" as the case may be, except that such information may appear on a separate strip label, front or back, if the name and address of the person for whom the product is bottled, preceded by the phrase "Bottled for," or "Distributed by," is on the brand label
4. The alcoholic content by volume, required under the provisions of the Federal Alcohol Administration Act only on labels of wine containing more than 14 per cent of alcohol by volume, but required under Internal Revenue Regulations 7, 11 and 15 on labels of all wines bottled on bonded winery, bonded storeroom, taxpaid warehouse, or rectifying premises
5. Net contents, unless such statement is blown or branded in the container

On the distilled spirits brand label—The mandatory information requirements are as follows:

1. Brand name
2. Class and type
3. The name and address of the distiller, rectifier, bottler or importer, preceded by the phrase "Distilled by," "Blended by," "Made by," "Prepared by," "Manufactured by," or "Imported by,"—unless the name and address of the retailer or distributor, preceded by the phrase "Bottled for," or "Distributed by," appear on the brand label, in which case the mandatory "name and address" data may be on a separate label
4. The age of brandy, if less than two years old

On the Government label—Unless all of the mandatory information (including the following) appears on the brand label, there must be a separate back label known as the Government label which must bear the following:

1. Class and type
2. Alcoholic content by proof, except in the case of cordials, liqueurs and specialties, when the alcoholic content may be in volume percentage
3. Net contents, unless blown in the bottle
4. Age or storage statement (in the case of whisky, or one of the varieties of straight whisky) and percentages (in the case of blended whiskies or blends of straight whiskies)
5. Percentage of neutral spirits (when required) and name of commodity from which distilled
6. Artificial or excessive coloring (if used)
7. The state of distillation (in the case of whisky or any of the varieties of straight whisky)

It should be noted that although only labels affixed to bottles of distilled spirits introduced in interstate or foreign commerce are subject to the labeling provisions of Regulation No. 5, similar labeling requirements are contained in Regulation No. 13, which is applicable to *all* distilled spirits packaged for sale at retail.

On the malt beverage brand label—In the case of malt beverages, the following label information is required:

1. Brand name
2. Class and type
3. Name and address of the brewer or bottler—in addition to name and address of a distributor or retailer, preceded by "Distributed by" or "Bottled for," which may appear on the brand or back label
4. Alcoholic content statement, only if specifically required by state law
5. Net contents

Generally speaking, all of the labeling regulations under the Federal Alcohol Administration Act contain requirements concerning: contrasting background, size of type, English language, location of label, labels firmly affixed, additional information on labels, representations as to materials.

The regulations also provide for the submission to the Bureau of full and accurate statements of composition when required. They also list certain prohibited practices such as the simulation of Government stamps, the use of misleading statements and statements relating to curative or therapeutic effects.

The Federal Alcohol Administration Act provides also for the issuance of certificates of exemption from label approval, if the bottler, producer, blender or wholesaler of wine is able to show to the satisfaction of the Bureau that the alcohol beverages to be bottled will not be sold, or offered for sale, or shipped, or delivered for shipment or otherwise introduced in interstate or foreign commerce. The statute provides, further, that alcoholic beverages may not be bottled or introduced into commerce unless the bottler has in his possession either a certificate of label approval or a certificate of exemption

[1] Issued pursuant to provisions of Federal Alcohol Administration Act. Items without footnotes are Internal Revenue regulations

from label approval covering the labels used in such bottling operations. Applications for certificates of label approval (Form 1647) or exemption from label approval (Form 1648) may be obtained from the local office of District Supervision, Alcohol Tax Unit.

Detailed information as to the labeling requirements of the various regulations may be obtained from the Alcohol Tax Unit, Bureau of Internal Revenue, Treasury Department, Washington, D. C.

Regulations 5 and 13 prescribe standard sizes for liquor bottles. They are: 1 gal., 1/2 gal., 1 qt., 4/5 qt., 1 pt. and 1/2 pint. In addition, 4/5-pt. containers are permissible for bottling Scotch and Irish whiskies, and Scotch- and Irish-type whiskies, as well as brandy and rum. Regulation 5 also provides for containers of specified sizes of less than 1/2 pint.

Regulation 4 prescribes standard sizes for wine bottles used for the interstate shipment of wine. They are: 4.9 gal., 3 gal., 1 gal., 1/2 gal., 1 qt., 4/5 qt., 4/5 pt., 2/5 pt., 4 oz., 3 oz. and 2 ounces. Nonstandard wine bottles, such as pints, may be used only for the intrastate sale of wine, and then only if the bottler holds a certificate of exemption from label approval covering the labels affixed to such nonstandard bottles.

The regulations also provide for the application of tax stamps over the mouth of each bottle of distilled spirits, on containers of compounds containing distilled spirits and on bottles of certain wines. Stamps may not be concealed or obscured. The Internal Revenue Regulations also provide for the manner of affixing stamps on bottles, as well as stamps and markings on cases and barrels.

Regulations concerning foods, drugs, cosmetics

Under the Wheeler-Lea Act, an amendment of the Federal Trade Commission Act passed in March of 1938, the Commission was given more effective powers of control over false advertising of foods, drugs, devices and cosmetics. Detailed information may be obtained from any office of the Commission.

There are a number of statutes, relating to foods, viruses, serums, toxins, etc., that fall under the jurisdiction of the Food and Drug Administration. These include the Filled Milk Act, Import Milk Act, the Tea Importation Act and the Federal Caustic Poison Act. Relating specifically to the Federal Food, Drug and Cosmetic Act are the Act of March 4, 1923, defining butter and providing a standard therefor; the Act of July 24, 1919, defining wrapped meats as in package form; and the Seafood Act of August 27, 1935. The Agriculture Department administers the Insecticide Act.

Labeling of wool products

One of the important special statutes is the Wool Products Labeling Act of 1939, which became effective July 15, 1941. Under its rules and regulations every wool product subject to this act must be marked by a stamp, tag, label or other means of identification.

The information must include the fibre content of the product, the maximum percentage, by weight, of any nonfibrous loading, filling or adulterating matter, and the name of the manufacturer, or of a person subject to Section 3 with respect to the product.

The name of the manufacturer need not appear upon the label if it bears an identification number registered and assigned by the Federal Trade Commission as the mark that identifies the manufacturer and by which the latter is bound as fully as though his name were used; provided that, in addition to this number, the label or mark of identification bears the name of at least one seller, whether retailer or other seller. The name of the seller, together with the manufacturer's registered number and the content information, should remain on the label.

To use a registered number instead of his name upon the label or mark of identification on his product, a manufacturer may make application to the Federal Trade Commission. The Commission will assign to him such registered number or numbers as are appropriate for his use and will suggest the form for the label or mark.

The stamp, tag, label or other identification must be appropriate to the nature of the product and must be affixed securely enough to remain on the product in good condition throughout the sale, distribution and handling of the product until delivered to purchaser.

The label or other mark of required information must be affixed to and displayed on the container, wrapper, binder or other means of packaging of wool products:

1. Where marking the product itself is impossible, or would be inadequate to give consumers the required information or to prevent deception; or—
2. Where the wool products are marketed or sold and delivered in a container that remains intact until after it is delivered to the consumer. If possible, the packaged product must also be marked appropriately in order to show the content of fibre and material, especially if it is likely to be removed from the sealed container or the container is to be opened for purposes of display, or other reasons, before it is purchased. Where the product bears a label or mark of identification which is clearly visible to the purchaser, no label or mark of identification need be placed on such container.

The stamp, tag, label or other mark of identification required under the act, or the required information contained thereon, must not be minimized, rendered obscure or inconspicuous or be so placed as to be likely to be unnoticed or unseen by purchasers due to:

1. Small or indistinct type
2. Failure to use letters and numerals of equal size and conspicuousness in naming all fibres and percentages of such fibres, as required by the act
3. Insufficient background contrast
4. Crowding, intermingling or obscuring with designs, vignettes or other written, printed or graphic matter

Sins of misbranding

by S. L. Mayham

In the days of the Old West, a certain stagecoach line manager had a favorite question which he asked all candidates for jobs as drivers. The question was, "How close can you drive a stagecoach to the edge of that road that runs along the cliff?" Some candidates would reply that they could drive within two feet of the edge. They were put on the waiting list for the job.

Once in a while a candidate would say he could come within an inch of the edge. He went further down on the waiting list. Sometimes a foolhardy soul would say he could drive with one wheel over the edge. He was promptly dropped from consideration. Once in a while the candidate would say, "I will keep just as far away from the edge as I can," and he usually was the one who got the job.

Manufacturers considering the legal requirements of their packaging and labeling may be compared to these various candidates. There are too many who either willfully or inadvertently see how close they can come to the edge. Once in a while, one gets all four wheels of the stagecoach over the edge and ends up on the rocks of legal difficulties.

In our work, we are privileged to see a great many packages and a great many labels. Fortunately most of them are pretty good. They are at least one foot from the edge, and a good many of them are about as far away from the cliff as they can get. However, too many manufacturers are still driving dangerously close to the cliff—some of them because they do not thoroughly understand what is required, but many of them intentionally.

Bad labeling and bad packaging follow fairly standard patterns, and there are a considerable number of standard errors. Perhaps it would be useful to point out some of the most frequent of these errors and express the pious hope that those manufacturers who have fallen into them will get a little farther back away from the edge of the cliff.

Required information

Conspicuous information—In labels, perhaps the most frequent error is that the required information (name and address of the manufacturer or distributor, and net contents) is inconspicuous. The law and regulations provide that this information must be conspicuous "as compared with other words, designs and devices" appearing on the label. A good many of the labels have the manufacturer's name or the brand name of the product in print which even a semiblind man could read and then have the address and the statement of contents in such tiny type that the best eyes would need a magnifying glass to see it. That is definitely not in compliance with the existing laws.

Another frequent cause of inconspicuousness is the poor choice of inks and colors. Often the name, address and statement of contents, while in reasonably large type, are printed in a color which makes them almost impossible to read in ordinary light due to insufficient contrast between color of printing and background.

Even more frequent are cases where the brand name of the product alone is large, clear and distinct, but the manufacturer's name and address and the statement of contents are very small. This is not permissible. Food and Drug Administration officials are insistent that statements of net content, in terms of weight, measure or numerical count, be clearly understandable and conspicuous.

Net contents—With respect to the statement of net contents, the law requires, in the case of liquids, that containers of $^1/_8$ oz. or more must be labeled, and, in the case of solids or semisolids, that net weights of $^1/_4$ oz. or more must be stated. It is a frequent misconception that liquid containers of $^1/_8$ oz. are exempt and that solid and semisolid containers of $^1/_4$ oz. are exempt.

On liquids, statement should be in fluid ounces; frequently it is not. On solids and semisolids, it should be in ounces by weight. However, it is not always so stated. In the case of liquids, best procedure is to label the product: "Contents 2 fl. oz." In the case of solids and semisolids, the best practice is to state: "Net weight 2 oz."

1—On Zemacol packages, the design and contrasting colors ensure readability of required statements. Such data appear on both the carton and the bottle for the greater convenience of prospective users.



NOTE: Preferring positive and constructive illustrations to "horrible examples," the editors of MODERN PACKAGING ENCYCLOPEDIA selected packages which represent exemplary practices rather than violations. Any drug store contains both, with correctly labeled products fortunately in the majority.

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There is also a less well-known provision of the regulations which is frequently violated. This is that the contents must be stated in terms of the largest quantity by weight or by measure in the package. For example, a bottle of liquid containing 20 fluid oz. is incorrectly labeled if the label says: "Contents 20 fl. oz." It should be stated instead as: "Contents 1 pt. 4 fl. oz." or "Contents $1\frac{1}{4}$ pt." It is the belief of the authorities that on packages of this size the purchasing public understands pints and fractions thereof better than fluid ounces.

However, although the trade of course understands that $\frac{1}{8}$ oz. is 1 dram, authorities believe the public does not understand the word "dram." Accordingly, they prefer that this quantity be stated as: "$\frac{1}{8}$ oz.," although no case has been brought against any manufacturer who labeled such a small package: "1 dram."

Position for required information—The law and regulations are clear that the required information must be on the principal label. There are very few exceptions to this rule. Manufacturers have not followed this as completely as possible. Quite often designers have a tendency to feel that their labels are being "spoiled" if contents and the manufacturer's name and address appear on the front label. In almost every case, this is complete nonsense, because it is quite possible to design attractive, interesting and appealing labels with the complete information stated on them. It has been done by many of the finest perfumers, whose labels must be attractive if any are.

Quite frequently, the brand name or a distinguishing design appears on a front label, and the required information is placed on a direction label on the other side of the package. In very few cases is this permissible. Occasionally a manufacturer of a liquid product will print the required information on the reverse side of the label so that it is readable only through the liquid. This definitely is not in compliance with the law. In fact, in such cases we would say the driver has at least two wheels over the edge of the cliff and is in definite danger.

In the case of powder and other similar products where there is a bottom direction label, there has been a tendency to place the required information on that label only. This is permissible if there is no wording and no distinguishing design or device on the top or side of the package. If the brand name or the manufacturer's name appears on the top or the side, the required information must be on that panel. Exceptions might be permitted in cases where the brand name appeared on the top of a powder box and the required information appeared printed in legible type of good size on a band around the side of the box, but in such cases a good deal of care should be taken to make the required information sufficiently conspicuous to the user.

Sins of omission—Sometimes part of the required information is clearly printed, but some of it is missing. Quite often the statement of contents is omitted from the principal label even though the manufacturer's name and address appear thereon. Occasionally, the address is omitted. More frequently, the address is so abbreviated as to be meaningless to many purchasers. If there is any doubt, addresses should be spelled out completely. Where the name of the manufacturer or distributor cannot be found in a city telephone book or a city directory, it is necessary to place the complete street address on the label. We have yet to see a label which contained a complete street address, although we believe it should be on many of them.

Use of the word "Distributor" or the wording "Distributed by" or "Manufactured for" is required where the name appearing on the label is not that of the actual manufacturer of the goods. The position of the authorities is that where a name alone appears, the public is led to believe that the person named is the actual manufacturer. This seems to be reasonably well understood, but there are undoubtedly cases where this identifying word does not appear. It is not, in the opinion of the enforcement authorities, a minor violation of regulations.

Drugs and cosmetics—Under the Federal Food, Drug and Cosmetic Act, a considerable number of products are both drugs and cosmetics. Where the product is designed to affect the structure or any function of the body, the product, while it may be a cosmetic, is also a drug under the law. For example, an antiperspirant lotion which is designed to affect the functioning of the sweat glands or to temporarily contract the pore openings, is not only a cosmetic—it is also a drug. The law requires that the names of the active ingredients of any drug appear on the label, and again the word "label" means the principal label. There are probably some manufacturers who do not realize that certain of their cosmetic products are also drugs, and accordingly, omit the statement of active ingredients. In every case of doubt it is much safer to place the names of all the active ingredients on the label.

When the product becomes a drug, there are certain further requirements. All drugs intended for general purchase by the public must contain adequate directions for use, and in some cases a warning statement concerning the effects of the active ingredients is required. These directions must be clear and definite. If they do not appear, or if they are not sufficiently definite, the product is misbranded.

In addition to the foregoing legal requirements, where a cosmetic product is also a drug, a statement of the kind and the quantity of any alcohol contained in it must appear upon the label. This statement is omitted on a great many labels.

Outer carton—Where a product is contained in a bottle and that bottle, in turn, is placed within a carton or box, the required information must be repeated. It is insufficient to place it on the bottle alone because, in theory, the purchaser is entitled to see the required information without opening the package. It is also insufficient to place it on the carton and omit it from the bottle because, in theory, the purchaser will discard the carton and retain only the bottle and he is entitled



2—Antiperspirants like Nonspi are drugs as well as cosmetics. Principal label must therefore bear names of active ingredients in addition to the usual required information. In the case of a small bottle, this relegates directions for use to a supplementary back label.

to have the required information at any time during the use of the product.

In the case of many cartons, several faces may be considered as the "principal label." In cases where there is any doubt as to which is the principal label, the required information should appear on each of the panels in question. Perhaps the best test on this point is to determine how the storekeeper would display the product. If he might display it with more than one panel facing outward on his shelves, the required information should be on each panel which might be so displayed.

Combination boxes—There seems to be less understanding of the requirements of labeling combination packages than of almost any other point. Where more than one package is placed within a combination box, the required information must appear not only on the individual items but also on the outer container. This information must consist of a complete listing of the contents of the box including the net contents of each package contained in the box, where such package requires a statement of net contents. In addition, the manufacturer's name and address and a statement of net contents must appear on each individual package. The manufacturer's name and address must also appear on the outside of the box. Very frequently, the list of items in a combination package is not complete; this is a violation. Quite often, the net contents of the items is not stated on the outside of the box; this also is a violation. Less often, the manufacturer's name or the address does not appear on the outside box or on each of the items therein; it must appear in both places.

It is permissible to state the net contents in terms of numerical count. Very few such statements appear and occasionally, as in the case of a box of bath tablets or several vials of bath oil of the same odor in a box; the quantity statement is omitted where it could readily appear in terms of numerical count.

Maximum price statements—In addition to the standard requirements of the Food, Drug and Cosmetic Act and the various weights and measures laws, during the past few years there have also been certain emergency requirements with respect to prices of goods. Where cosmetics have been priced under the regulations of the OPA, a label or tag must be firmly affixed to each package, containing the following wording, "Retail ceiling price $— (MPR-393)," or in the case of professional packages, "Professional size. Ceiling price $— (MPR-393)." In the case of drugs, the statement should be "MPR-392." Where a price appears on the label it is the duty of the *retailer* to indicate that the 20 per cent Federal excise tax must be added to the stated price. This is not the responsibility of the manufacturer, but many manufacturers are cooperating with retailers in order that the statement regarding tax will appear in accordance with Treasury Department and OPA regulations.

Deceptive containers

Unfortunately, there are still a few manufacturers, with all four wheels over the cliff, who are placing their products on the market in deceptive containers. The law is specific that a cosmetic is misbranded "if its container is so made, formed or filled as to be misleading." There has never been any excuse for a misleading container, and yet the cosmetic and drug industries are still frequent offenders in this respect. Misleading packages fall into two classes—those that are not filled full, and those which are designed so as to deceive the purchaser as to the quantity of the contents even when full.

Filling—The most frequent offenders of the first type, in the case of cosmetics, are powders which do settle to a certain extent after packaging. Production engineers are authorities for the statement that there is practically no powder which cannot be packaged in such a way that it will fulfill all legal requirements when it reaches the purchaser. Failure to fill in this

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3—Because value of cosmetic preparations depends greatly upon appearance, authorities allow reasonable latitude in container design. But Ponds and most other large producers are scrupulously careful to heed label requirements when planning attractive packages.

way is the responsibility of the manufacturer and the excuse that the powder settles is not acceptable.

Deceptive shapes—In regard to the other misleading container type, it should be pointed out that no statement of the net contents, no matter how large or how conspicuous, relieves the manufacturer from the responsibility that his packages be so made as not to be misleading.

Probably all of us recall the old type of flavoring extract bottles with the deep-set panels. Some of them looked as if they contained a pint, while they actually contained barely 2 oz. of liquid. Even if the net contents were stated in letters an inch high, this bottle would be a misleading container. In the cosmetic and drug industries, jars with abnormally thick walls would be considered misleading. As an example, we might cite the jar which is oval on the outside with a round bowl for the contents. Undoubtedly the purchaser thinks he is getting more than he actually receives, at least when he buys this jar for the first time. Then there is the jar with the thick bottom or the deeply depressed bottom. Fewer of these are now on the market than formerly.

With respect to boxes, there have been such things as false bottoms but there are few, if any, of these on the market now. It is, however, just as misleading to leave a large space for a powder puff in the top of a face powder or dusting powder box and not supply the puff to take up the space. Occasionally, a carton containing a bottle is so much larger than the bottle itself that it must be classed as a misleading container. Sometimes, too, bottles with narrow waists or excessively sloping shoulders are packed in rectangular cartons. These the authorities consider misleading, but they have compromised to the extent that such packaging will be permitted where an actual sized facsimile appears on the outside of the carton.

The authorities are inclined to be reasonable in cases where the package itself is a considerable element of the final value of the product, or where artistic elegance demands certain packaging features not in line with the factor of strict utility. For example, a perfume bottle may be formed and shaped more liberally than a bottle of a lotion or a hair preparation. The box which encloses a perfume bottle need not adhere so strictly to size and shape requirements as one containing some other less glamorous product, but these concessions should not be taken as a blanket license "to go high, wide and handsome."

Legal enforcement of requirements

It is reasonable to wonder why all of these violations continue on the market in spite of the fact that the new Federal Food, Drug and Cosmetic Act has been in effect for seven years. The answer is twofold. First, when the law went into effect, the administrative officials quite naturally got after the most serious violations first. Among these serious violations were the presence on the market of products injurious to health and the serious misbranding of foods and drugs.

At just about the time when cosmetics and proprietary packages and labels would have come into serious consideration and when strict enforcement would have been started, the Administration was forced to engage in work directly connected with the war, and at the same time suffered serious personnel difficulties. While this slowed up or checked strict enforcement of the labeling and packaging provisions of the act, it did not stop the collection of information and, in some cases, the preparation of cases to be brought at the earliest convenient moment. Now that the work of the Administration is returning to normal, increasing attention will be directed toward cases involving many, if not all, of the violations outlined in this article.

(See also *Governmental Regulation of Packaging*, p. 99.)

Effective use of patents

by George S. Hastings

The effort, time and money expended by many firms today in programs of packaging research are investments expected to pay dividends in the development of packages which provide greater protection, sales appeal, efficiency or economy. However, if full benefit is to be derived from the improved packaging, some attention should be directed toward the legal aspects of invention. This is necessary partly to prevent the possibility of trespassing on territory legally protected by another's patent, and also to protect the invention from infringement by competitors.

Effective use of patents is the surest single method of protecting the results of research. Other measures taken with this intent are apt to prove inadequate. Merely keeping the invention a secret is a negative and highly risky practice. Even trade-marks (see *Proposed Changes in Trade-mark Law*, p. 116, and *Legal Trends Affecting Trade-marks*, p. 119), though they may be valuable supplements, are usually not satisfactory substitutes. This discussion, therefore, will be confined to the patent, as a medium for establishing inventors' rights.

One object of this article is to eliminate some of the more common misconceptions concerning patents. However, its main purpose is to suggest how best to use the specialized patent knowledge of others in protecting the results of research. Indeed, in this highly technical field, it is upon the knowledge of others that those interested in the patenting of inventions must usually rely.

However, it is important for the inventor or the promoter of an invention to recognize when patent help is needed, and to have some factual background in order to discriminate between reliable and unreliable sources of information. In brief, to protect an invention, it is necessary to have an appreciation, based upon facts, of what the proper use of the U. S. patent system can do for research.

Patents provide a powerful and stimulating incentive system for industrial research, and the success of this system is demonstrated by the leading part patents have played in the development of our country since the first patent legislation was passed in 1790. The effect of this incentive system is to make it worthwhile for the inventor, developer and promoter to spend the money, effort and time necessary to produce and commercialize something which is new and better for the public's use.

The theory and basis of our United States patent system is summarized with characteristic clarity and conciseness in Article I, Section 8, of the Constitution, which provides that: "The Congress shall have power: . . .To promote the progress of science and useful arts by securing for limited times to authors and inventors the exclusive rights to their respective writings and discoveries."

Note, particularly, that the primary object of the patent system is to benefit the public by promoting the progress of science and the useful arts, the benefit to the inventor being secondary. Of this the courts are well aware, and anyone attempting to obtain a valid patent must be prepared to demonstrate that his invention promotes the arts in such a manner as to be of benefit to the general public.

Common misconceptions

Probably more misconceptions are prevalent regarding patents than concerning any other well-known subject. It has been wisely stated that it is not so much what people *don't* know about patents that gets them into trouble as it is what they *do* know about patents—that is, what they *know* about patents which isn't so.

The nature of the protection granted by patent becomes clearer upon consideration of some of the more important fallacies commonly held concerning patents, of which the following are examples:

That the patent certificate means exactly what it says when it states that the inventor is given the exclusive right to make, use and sell the invention—Actually the inventor is not given the right to make, use and sell, but simply the negative right to exclude others from making, using and selling the invention which is covered by the claims of the patent.

Thus, a person who acquires a valid patent acquires two things:

1. Freedom from being excluded by the former patent owner from practicing the invention covered by the claims of the patent
2. The right to exclude others from practicing the invention covered by the claims

In short, a patent is like the fence around a newly cleared field and not the field itself. But it must be remembered that after 17 years the fence comes down and the field becomes public property.

That the invention protected by the patent is that which is described or illustrated in the patent—The patent covers the invention which is *claimed* at the end of the patent and not that which is described or illustrated therein. The latter is merely included as an example which explains and illustrates the invention which is claimed in the patent.

In other words, the area fenced in by the patent is determined from the claims.

That the first to invent or the first to file is thereby entitled to the patent—According to United States practice, the first to invent is entitled to a patent, as against

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someone else who invented later but filed earlier, *if* he can prove that he was the first to invent—and satisfactorily meets certain requirements as to diligence in carrying his invention forward either to successful test (known as reduction to practice) or to filing.

The thought behind this principle is not to penalize the inventor who works his invention out thoroughly before filing. However, it may nevertheless be true that the earlier inventor who files later may have difficulty in proving he was first and that he was sufficiently diligent. The great value of filing first and thus putting the burden of proof on the other party, is shown by the fact that in a great majority of patent interferences the first to file gets the patent.

That the grant of a patent protects the owner of the patent from infringement if manufacture is in accordance with the disclosure of the patent—There may be an earlier patent having claims covering the same invention, even though the later device is different enough so that a patent was granted on the differences.

It is always well to remember that the Patent Office is looking out for the welfare of the public, not the inventor, and examines patent applications to determine whether they will promote the useful arts. The Patent Office pays no attention to whether or not the inventor's ideas infringe.

That because an invention looks the same as one already patented it infringes and because it looks different it is free from infringement—Neither is a really safe test. The real test is that the essential structure, function and result is the same as that claimed in the patent, regardless of superficial differences and likenesses in outward appearance.

It is a fairly common occurrence for the defendant in an infringement suit to be quite surprised when told he infringes, because his product looks so different from the plaintiff's that he overlooked the fact that the principle was the same.

That employees have to assign to their employers inventions made during their employment—In the absence of a contract, such an inventor does not have to assign to his employer. This is true even though such inventions relate to the employer's business or are made through use of the employer's time and the employer's material.

Exceptions arise when the employee is specifically hired to make a definite type of invention. A very limited license or shop right may arise when the employer's time and material are used. From the point of view of the employer, the only effective safeguard is for him to have a specific contract with the employee which will clarify any subsequent misunderstanding.

That a patent is presumed valid until proved invalid—This was once a reasonably correct assumption. But, there has been a raised standard of invention on the part of the courts, especially the United States Supreme Court, without a corresponding change in the standard of invention utilized in the examination of patent applications in the Patent Office. Furthermore, the Patent Office is understaffed, and the examiners often do not have time to make an adequate search. For these reasons, it is much safer and more realistic to assume that a patent is invalid until investigation has revealed a good reason to believe that it is valid.

What patent help is needed and when

The misconceptions outlined above could be multiplied, but they show sufficiently the danger of assuming anything to be true of patents because it is common knowledge.

In the field of patents, unless the answer is known beyond doubt, it is far safer to investigate or to get expert advice.

Enough has been said to make it clear that a research organization needs patent help long before it is ready to file a patent application or has developed a marketable product.

In the early stages of development of a small research organization, what is needed first is a capable outside patent attorney, or firm of attorneys, plus good patent liaison facilities. A good patent liaison man is one who really knows the values of the art of his particular organization and who sees that proper records are kept and refers matters to the outside attorneys as soon as it is apparent that a patent question has arisen or that an application for a patent should be filed.

At this stage, it is not necessary that the liaison man be able to do the actual patent soliciting, though it is later often found desirable to combine both functions in the same person.

Good management of the patent affairs of a research organization is largely a matter of foresight in promptly appreciating when a patent problem is arising and of getting competent advice in handling the problem in order to avoid trouble later.

A case history

Suppose, for example, the research organization of Blank & Blank is given the problem of making a moistureproof package for breakfast food. Immediately, the organization's patent man realizes that a part of the preliminary study should be an investigation of the various patented solutions to this problem, especially in connection with the packaging of cereals and the like, and that at this point it should be arranged to make such a thorough study. Frequently, such investigation reveals that no research is needed to solve the given problem because the solution has already been described in a patent.

However, should subsequent research settle on one type of moistureproof coating, the patent man realizes that an infringement or right-to-use question may arise, and that an expensive development program should not be embarked upon without a search to determine whether or not infringement is present. Indeed, a search of this type may well serve many purposes, for it is quite apt to elicit helpful data for facilitating the research and development program, as well as valuable information as to what competitive or-

ganizations have been developing along the same lines.

Suppose, after the expenditure of some thousands of dollars, it is discovered that by addition of a certain ingredient to the coating, a surprising increase in the strength of seal and resistance to water-vapor transmission is obtained. At this point the experienced patent specialist appreciates the fact that a valuable invention may have been developed. He will want the date when the discovery was made, and the signature of the inventor to his discovery, corroborated by witnesses.

The organization's outside patent attorney is then informed of the origin of the invention, of the nature and degree of improvement in performance it effects, and of what was previously tried. Alternatives are suggested and considered to show the possible equivalents and to demonstrate the entire scope of the invention. With this knowledge the patent attorney is in a position to lay the basis for a suitable patent. He can then file an application for a patent in the full light of knowledge of the prior history of the invention. He knows what difficulties have been overcome, what is important and what is trivial, and he knows exactly what distinguishes this invention from all prior ones.

Then suppose that Blank & Blank decides to market the product in quantity. Before this is undertaken, the patent attorney is asked to determine that final changes and additions do not infringe. The patent attorney, at this point, also determines whether any such changes are worth patenting, in order that they may be filed on within a year of public use or sale. After a year of public use of a product it is too late to file and obtain a valid patent. Public use, incidentally, can occur long before large-scale marketing, or even before products leave the factory, if experimentation is no longer necessary and if the products are sold or if they have been demonstrated for the purpose of obtaining a sale.

Blank & Blank, let us say, puts the product on the market and it proves to be a great success, but a competitor comes out with a waterproof package having a coating containing an equivalent ingredient and producing the same results. Another competitor gives notice that Blank & Blank's product infringes his slightly earlier patent.

Blank & Blank is able to meet these challenges with complete confidence. It has had continuous patent advice. It has good records. Its attorney knows when the inventions were made, how the product was developed, and what the prior art was, so that Blank & Blank's knowledge through patents has given some intimation of what these competitors were most likely to do. The patent alleged to be infringed upon has already been considered, and a defense is ready. The equivalent ingredient has also been considered and the claims drawn to cover it.

But just imagine the consternation on the part of the management of Blank & Blank if its research department had made no patent preparation! Yet it is not unusual for concerns conducting research work to secure patent advice on a product for the first time when it is about to be marketed. These firms have lost much money and wasted much research effort by such unwise delay in obtaining patent advise.

Outside patent counsel

Most organizations conducting research employ outside patent counsel. Organizations not availing themselves of help of this nature should promptly take measures to secure it.

Selection of a patent attorney is a step of great importance, requiring the same careful consideration as the selection of a general attorney. Usually, patent attorneys can be located through affiliated companies, who already enjoy satisfactory patent counsel, or through the company's general counsel.

It is well to check the candidates in two ways: If they are to be used to solicit patents before the Patent Office, it can be determined whether or not they are registered for practice before the Patent Office by requesting a list from the Patent Office of registered attorneys, and since patent attorneys are registered serially, the registration number gives some indication of their experience. If the attorneys are located in a large city, their standing in the patent association of that city may be ascertained without much difficulty.

It is often urged that it is desirable for a patent attorney to be located in Washington, convenient to the Patent Office. However, it is much more important for him to be located near the client, in order that close contact may be maintained between client and attorney and in order that the attorney may confer directly with the inventors and engineers. In this way he will be able to see tests and to examine samples throwing light on the inventions which are to be patented.

How to organize a patent department

For small companies, not offering enough patent work to utilize more than half of a man's time, no patent department is necessary, other than a liaison man, familiar with the commercial and patent values of the company's business, to act as an intermediary between the company and the outside patent attorney it employs.

As a company grows larger, it usually becomes desirable to accomplish part of the patent work within the company organization, particularly soliciting before the Patent Office, making searches, making preliminary determinations as to infringement questions, building up a patent library, and similar work which requires frequent and continuous contact between the patent adviser and research worker.

Hence, most large concerns for which research is important find it desirable to establish an inside patent department of their own.[1] The outside patent counsel is very valuable at this point in helping to secure patent men who will be able to handle the job.

Generally speaking, such men should have some tech-

[1] See Otto S. Schairer, "Patent Department Organization," *Journal of the Patent Office Society*, XXII, No. 12 (December, 1941), p. 875.

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nical training, plus training in patent law and in the handling of patent applications. They should have obtained law degrees or should be prepared to do so.

Such men would at first work under the close supervision of the outside counsel, and they would continue to work with the advice of outside counsel whenever any matters of special importance or of unusual difficulty arose.

In selecting personnel for the patent department, it is important to consider their ability to get along with the workers in the concern. If there is a qualified individual already connected with the concern, especially in its engineering department, with a flair for patents, he might well be selected for the purpose, and given such further training as is needed to qualify him fully to practice before the Patent Office.

Making effective use of patent counsel

Regardless of whether an organization has its own patent department or merely consults an outside patent attorney, close cooperation is important.

The way to obtain a poor patent is simply to hand over to the patent attorney a description of the invention and then sit back and wait for the issue of the patent. As much depends on the diligence and completeness with which the research organization plies the attorney with information as on the attorney himself. To do his work, the attorney must be furnished with complete data.

Securing a good patent is a continuous process and involves supplying the patent attorney with much more than the detailed disclosure of the invention to be patented. To do a good job the patent attorney must know the background of prior art in which the new development arose.

Drawing the claims to the invention requires that the patent attorney cover the inventor's actual contribution. At the same time, he must carefully exclude from the scope of the claim that which was known prior to the invention at hand.

There is also the matter of emphasis. An attorney can draw claims to all features of the invention with equal emphasis—in fact, he will have to do this unless someone aids him in determining what is important and what is unimportant. Without this knowledge it is quite easy to end up with a patent having excellent claims to that which is of no importance and *having no claims* at all to that which *is* important.

Good claims to subject matter which has a commercial value are comparatively difficult to obtain, due to more extensive prior art and greater danger of conflict, and the consequent reluctance of the patent examiner to grant such claims in the anticipation of interferences and infringement suits which might subsequently reverse his decision. Unless the attorney has a correct evaluation of the important features to be emphasized, he is likely to be misguided into obtaining those claims which may perhaps possess the least commercial value.

Patent attorneys cannot work in a vacuum. They need patent ammunition, and they need it even when they don't know that it exists or when they think they have enough. If a good patent is to be obtained, those handling the research and development must ensure that the patent attorney gets this ammunition—and that he gets it whether he asks for it or not. Such patent ammunition includes any information which may throw light upon:

1. The real nature or value of the invention
2. The difficulties overcome in making the invention and in successfully applying it
3. The impact of the invention on industry
4. The manner in which the invention was developed
5. What competitors are doing
6. How the invention affects costs and how it affects the consumer
7. What feature appeals most to the user
8. Test results, which should include the failures as well as the successes

Any information about alternative constructions, substitutes, simplifications, modifications, etc., is also vital, and it could easily account for the difference between an effectual patent and one which proves to be ineffectual in operation.

Procedure to follow during research

Only the proved acts of inventors are legally recognized. Ordinarily an inventor's unsupported evidence is not valid. It is imperative, therefore, that dated and witnessed records be kept of all of the research work which has been undertaken.

Various recording systems are employed. Some are quite elaborate, but the only requisite is that the inventor date and sign his disclosures and that he have them witnessed by someone who understands the invention. Bound notebooks with provision for detachable carbon copies have been found to be valuable. It is particularly important that the first sketches and drawings and first descriptions be signed and dated, even if only in scratch pad form. It is also essential that there be a set of dated records of the making and testing of samples or models, and that such tests be witnessed. These items are the backbone of the testimony when two inventions are thrown into interference because of similarity.

It is important for those concerned to follow the development of inventions sufficiently to know who invented any given article or device. The law requires that the inventor sign the patent, and if it is discovered that the patent was not signed by the real inventor (the one who invented the subject matter claimed), the patent is then not valid. Moreover, morale in a research organization may be seriously undermined if there can be any suspicion that the real inventor does not get the credit but that some more favored person has been permitted to sign the patent.

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Publications, such as scientific papers, should be watched in order that applications may be filed within the year allowed after publication.

Court decisions

Court decisions have had a definite bearing on protecting the results of research. Changes in the patent statutes are rare, but court decisions modifying the way in which the patent statutes are interpreted and applied have been frequent, amounting to judicial legislation of a far-reaching character.

During the past decade, the Supreme Court has raised the standard of invention to such an extent that only a rather small percentage of the patents coming before it during this period have been held valid.

In a number of recent patent cases which have come before the U. S. Supreme Court, the Court has weighed the public interest against the degree of incentive which should be provided for the inventor. It has quite evidently been the view of the Court that some of the rights of exclusion granted in patents could be cut down without any detriment to our present type of industrial economy.

Among these decisions are several holding that a patent to a combination of ingredients or parts may not be used to control in any way the unpatented ingredients, parts, or supplies, even though the ingredients, parts or supplies have no other use than in the patented composition or combination.

"Flash of Genius"—One famous decision of the Supreme Court, often known as the "Flash of Genius" case, has been cited as holding that the presence of invention should be determined subjectively—that is by consideration of the mental processes by which it was discovered, as well as by the more common objective test of judging an invention by what it is—that is by characteristics such as its novelty, usefulness, etc. It is questionable if the Supreme Court meant more than to emphasize and reaffirm the well-known test that an invention, to be patentable, must be sufficiently unobvious to be beyond the ability of the ordinary artisan skilled in that particular art.

One decision, by Thurman Arnold in the case of *Potts* v. *Coe*, went so far as to indicate that the identical invention might be patentable if arrived at by a flash of genius on the part of one inventor alone, but would not be patentable if it were the final result of systematic research in an organized corporate research laboratory. However, the Supreme Court recently flatly reversed this decision, as well as some other rather original contributions of Thurman Arnold to patent law.

1945 Decisions—Indeed, the Supreme Court in several decisions during the past year seems to have taken pains to make it clear that the rules for applying the patent statutes have not changed, but the same decisions also make it apparent that these rules are being applied less liberally than they were a few decades ago.

For example, in the Hartford Empire Glass Container case the Supreme Court stated: "That a patent is property, protected against appropriation both by individuals and by government, has long been settled." It denied a request by the Department of Justice that certain glass container patents be cancelled in effect and that compulsory licenses without compensation be given under others.

In the Ray-O-Vac case, covering a leakproof flashlight battery case, the Supreme Court reviewed the time-honored proofs of invention (novelty, filling of a long-felt need not previously satisfied, recognition and commercial success of the invention) and affirmed the decisions of lower courts holding the patent valid.

Another decision of the Supreme Court held invalid a quick-drying ink patent. Due to the particular solvent used, this ink remained liquid at normal temperatures long enough for printing operations, but dried almost instantly when slightly heated. The Supreme Court reviewed with approval the accepted tests of invention, conceded novelty and commercial value, but held that selecting the right solvent from those available was too obvious to amount to invention. Under a liberal interpretation the patent could have been held valid, but in keeping with other recent decisions the Supreme Court chose a strict interpretation.

Conclusion

The United States patent system is one of the most effective incentive systems known. Any organization which fails to take full advantage of it is overlooking a great source of industrial motive power. The system makes research which results in valuable new products self-financing by giving control for 17 years to the researcher or to his organization.

It also furnishes a very valuable incentive to the worker within the research organization, since it proffers a figurative medal of honor, and thus serves as a measure of accomplishment for promotions or bonuses.

The present temper of the courts and of Congress is to recognize true progress and to reward intellectual contributions to public welfare. But these powers are quick to withhold the benefits of our patent system when it is believed that patents are being used contrary to the intent of the Constitution, as an intrenchment against change or to maintain a favored position no longer justified by current benefits to the public.

Though there has been no change in the basic rules for determining the breadth and validity of patent claims, these rules will be strictly interpreted during the period just ahead. Therefore, those attempting to obtain valid patents must prepare from the start to demonstrate that their inventions are substantial advances well beyond the ability of the average skilled worker in the art and will promote the useful arts to an extent which will fully compensate the public for the patent rights granted.

Today, therefore, although competent patent advice is essential, it will prove ineffective in the long run, unless coupled with continued and vigorous research directed toward real advances.

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Proposed changes in trade-mark law

by Sylvester J. Liddy

The principal Federal trade-mark law, the Act of February 20, 1905, has been in force for about 40 years. It has been amended from time to time, and although it has worked fairly well, it is by no means adequate under modern business conditions to afford proper protection to the purchasing public and the trade-mark owner. The chief reason for the inadequacy of trade-mark law as it exists today is that in general it is geared to the economic world of 1905. Meanwhile, markets have expanded and advertising methods have changed radically. Consequently, the existing trade-mark law has been outgrown. (For a more thorough discussion of this point, see *Legal Trends Affecting Trade-marks*, p. 119.)

A new Federal trade-mark act is badly needed, and in the opinion of over 90 per cent of the members of the Bar who have studied the matter, the pending Lanham Bill will fill that need. This bill also has the approval and support of a great many national business organizations. It was first introduced in 1938 and has been introduced in every Congress since that time. The present bill was passed by the House over a year ago, but as we go to press it still awaits Senate approval.

Meanwhile, trade-mark practice remains very chaotic. The limits of this article will not permit mention of all the changes in our Federal statutory trade-mark law which this bill will bring about, but some of the more important changes and improvements should be noted. The Lanham Bill would: authorize a long-overdue codification of all Federal laws covering trade-marks, adapt trade-mark protection to national and international business, adapt our domestic law to our treaty obligations, forbid legal action for infringement after five years of continuous use, permit registration of service marks, grant concurrent registration of the same mark to two or more users acting in good faith, make it possible to assign a mark without simultaneously assigning an entire business, protect geographic and descriptive marks, sanction "secondary meanings" which have become distinctive, enable related subsidiary companies to use a parent company's mark, and simplify Patent Office procedure.

Incontestable right

Perhaps the most important change from existing law is the provision for an incontestable right. Under Sec. 13 of the present statute (Act of February 20, 1905), anyone who feels that he may be damaged by a registered mark may institute cancellation proceedings "at any time." Thus, despite the fact that a mark may have been registered under the present act for many years, the registration is always subject to attack and such a proceeding may possibly result in cancellation.

Under Sec. 15 of the Lanham Bill, if a mark has been on the principal register and has been in continuous use for a period of five consecutive years subsequent to the date of such registration and is still in use in commerce, the right of the registrant to use such a registered mark shall be incontestable. There are exceptions, of course, and adequate safeguards are provided to prevent abuse.

For example, if registration has been obtained fraudulently or contrary to other provisions of the act or if a mark has been abandoned, a registration may be cancelled at any time.

This opportunity afforded a trade-mark owner to obtain an incontestable right to his mark under proper circumstances and conditions will give trade-mark owners a great incentive to register their marks. This, in turn, will be of assistance to all users of marks and prospective users of new marks because it will make the register a more comprehensive source of information about marks in use than is now the case. At present, many owners of trade-marks used in interstate commerce do not register their marks, with the consequence that a search of the present register fails to disclose the existence of such marks, and much unintentional infringement results.

Service marks

Another important section of the Lanham Bill is the provision for the registration of so-called "service marks." A service mark is defined in Sec. 45 of the bill as "a mark used in the sale or advertising of services to identify the services of one person and distinguish them from the services of others and includes without limitation the marks, names, symbols, titles, designations, slogans, character names, and distinctive features of radio or other advertising used in commerce." This would extend trade-mark protection to an entirely different class of marks.

As an illustration, the identifying mark of a cleaning and dyeing establishment or of a laundry is a service mark. Many such marks are well known and are of great value, but under the existing statute they cannot be registered.

Concurrent registration

The Lanham Bill also provides for concurrent registration of trade-marks. One person or company may be using a particular trade-mark in interstate commerce but in only one section of the country. In an entirely different region, another person may be using the same mark in interstate commerce. Each may

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The Lanham Bill was passed by both House and Senate, and signed by President Truman in July, 1946.

own the mark in his respective territory, but under the present statute only the prior user may enter his mark on the register.

Under Sec. 2(d) of the Lanham Bill, each user can register under conditions and limitations as to the mode or place of use or as to the goods in connection with which such registrations may be granted, provided that the Commissioner of Patents (or a court on appeal) determines that confusion or mistake or deceit of purchasers is not likely to result from the continued contemporaneous use of the same trade-mark by two different manufacturers.

Good will

Under the present statute, an assignment is void which purports to transfer ownership of a trade-mark without the good will of the business in connection with which it is used.

The Lanham Bill (Sec. 10) provides that a mark shall be assignable with the good will of the business in which the mark is used, or with that part of the good will of the business connected with the use of, and symbolized by the mark. However, this bill further provides that in any such assignment, it shall not be necessary to include the good will of the business connected with the use of and symbolized by any other mark used in the business, or by the name or style under which the business is conducted.

Under such a system, if a business concern owns two or more marks for different products and wishes to sell that part of its business for which it uses one of its marks, it may do so, transferring the mark which symbolizes that part of its business, but retaining the remaining parts of its business and continuing to use the trade-marks symbolizing those portions of the business which are not sold.

Surnames and place names

The present statute forbids the registration of surnames unless they are distinctively displayed. This prohibition is a sound one, provided that the mark sought to be registered is *primarily* merely a surname. But many marks are *not* primarily surnames and, in fact, are only rarely found as surnames. Under present practice, however, the Commissioner must refuse registration if he finds the name listed even once in a telephone or other directory.

As an instance of this, in a recent and quite typical case (*ex parte Schultz-Rosky-Block Co.*, 579 O.G. 711) the Assistant Commissioner construed the present statute as follows: "Although the name is an unusual name, the statute makes no distinction between rare names and those in common use."

The same rule applies under the present statute with respect to geographical terms. If a word otherwise registrable happens to be the name of a hamlet or town in far-off India, registration will be refused. The size or importance of the community is of no consequence. It is ridiculous to suppose, in such a case, that the primary significance of the name is geographic, yet the present statute leaves the Commissioner no alternative but to refuse its registration as a trade-mark although it is used as such.[1]

These defects are cured in Sec. 2(e) of the Lanham Bill which states that such marks may be refused registration only when they are "primarily geographically descriptive of the goods of the applicant" (or deceptively misdescriptive of them), or when the mark "is primarily merely a surname."

Inflexibility of present law

In all cases dealing with the right to register a trade-mark, whether they be ex parte cases or inter parte cases, the decisions of the officials of the Patent Office and the decisions of the United States Court of Customs and Patent Appeals are administrative in character. The Court of Customs and Patent Appeals in trade-mark cases may be considered as part of the Patent Office machinery for administrative purposes, and thus a decision of this court is a mere administrative instruction to be observed by the Commissioner of Patents.

Under Sec. 13 of the present trade-mark statute, petition for cancellation may be brought "at any time." As a result of the inflexibility of the present law, the Court of Customs and Patent Appeals in a well-known case (*White House Milk Products Co.* v. *Dwinell Wright Co.*, 111 F. [2d] 490 at 493) made the following statement:

> The record shows that for many years appellee was aware of the use of the trade-mark by appellant and until the present proceeding was instituted made no objection to such use and that for a long period of time with said knowledge it sold its goods in part to the Great Atlantic & Pacific Tea Company which was the sole distributor of appellant's goods. While it seems strange that appellee, under the circumstances herein, has suddenly deemed itself injured, this, of course, cannot be considered by this court. Appellee, in the purely statutory proceeding provided for in said section 13, supra, had the right *whenever* it deemed itself injured by the registration of appellant's trade-mark, to file its petition for cancellation *at any time*. As we held in the case of *Cluett, Peabody & Co. Inc.* v. *Samuel Hartogensis*, etc., 41 F. 2d 94, 96, 17 C.C.P.A., Patents, 1166, 1170: "We think that the use of the words 'at any time' excludes the defense of laches in a cancellation proceeding instituted under the provisions of the section."

Despite the fact that this registration was therefore cancelled, in a subsequent suit in a court of equity brought by the successful petitioner for cancellation the equity court properly refused to restrain the use of the trade-mark "White House" (*Dwinell-Wright Co.* v. *White House Milk Products Co.* 132 F. [2d] 822).

The Lanham Bill in Sec. 19 provides that in all inter parte proceedings in the Patent Office and in the Court of Customs and Patent Appeals "equitable prin-

[1] The confusion existing in trade-mark law at present is indicated by the conflict of this provision with a provision of the Act of March 19, 1920, which permits registration of geographic names under certain conditions. (See *Legal Protection of Packages*, p. 98.)

ciples of laches, estoppel, and acquiescence, where applicable may be considered and applied," thus granting to the Patent Office tribunals and to the Court of Customs and Patent Appeals the right to consider such defenses in proceedings of this type.

Printers and publishers

Of particular interest to printers and publishers of periodicals is Sec. 32 (2) of the Lanham Bill. Printers and publishers may innocently infringe by unknowingly printing an infringing mark for others or by publishing a periodical containing an infringing mark. Sec. 32 (2) protects such an innocent infringer in the following language of the bill:

> Notwithstanding any other provision of this Act, the remedies given to the owner of the right infringed shall be limited as follows: (a) Where an infringer is engaged solely in the business of printing the mark for others and establishes that he was an innocent infringer the owner of the right infringed shall be entitled as against such infringer only to an injunction against future printing; (b) where the infringement complained of is contained in or is part of paid advertising matter in a newspaper, magazine, or other similar periodical the remedies of the owner of the right infringed as against the publisher or distributor of such newspaper, magazine, or other similar periodical shall be confined to an injunction against the presentation of such advertising matter in future issues of such newspaper, magazine, or other similar periodical: Provided, That these limitations shall apply only to innocent infringers; (c) injunction relief shall not be available to the owner of the right infringed in respect of an issue of a newspaper, magazine, or other similar periodical containing infringing matter when restraining the dissemination of such infringing matter in any particular issue of such periodical would delay the delivery of such issue after the regular time therefor, and such delay would be due to the method by which publication and distribution of such periodical is customarily conducted in accordance with sound business practice, and not to any method or device adopted for the evasion of this section or to prevent or delay the issuance of an injunction or restraining order with respect to such infringing matter.

Other changes

Other changes in the statutory law of trade-marks made by the Lanham Bill should be noted, although the limitations of space will not permit a detailed discussion of each provision.

According to Sec. 22 of the Lanham Bill, registration on the principal register would constitute constructive notice of the registrant's claim of ownership of the registered mark.

Provisions are also made in Sec. 5 and Sec. 45 for the use of a trade-mark by companies "related" to a parent company.

Marks which were originally geographic or descriptive in their meaning and which are not now entitled to registration under the Act of 1905, would be afforded protection under Sec. 2(f) of the Lanham Bill, if and when they acquired "secondary meaning"; that is, if and when they became distinctive of the applicant's goods.

History of the Lanham bill

A brief history of this bill will show the careful consideration it has received in both the Senate and the House of Representatives.

Trade-mark reform legislation was originally introduced in the House of Representatives by Mr. Fritz Lanham of Texas as H.R. 9041 on January 19, 1938. Hearings were held, but no further action was taken by the 75th Congress.

In the next Congress, H.R. 4744 was introduced and hearings were held on March 28, 29 and 30, 1939. Subsequently, this bill was revised and a new bill, H.R. 6618, was introduced on June 1, 1939. Hearings were held and the bill was reported to the House June 27, 1939 and passed the House July 17, 1939 under suspension of the rules. It was reported in the Senate on May 1, 1940, with amendments. It passed the Senate June 22, 1940, but a motion to reconsider was entered and agreed to on the following day, whereupon the bill was returned to the calendar and not reached again for Senate consideration before the expiration of the 76th Congress.

In the 77th Congress, H.R. 102, H.R. 5461 and the companion Senate bill, S. 895, were introduced. The Senate bill was reported July 22, 1941, and passed the Senate September 17, 1941. Further hearings were held in the House, and the Senate bill was reported in the House June 25, 1942, with amendments. It passed the House September 24, 1942, and went back to the Senate for action on the House amendments. Further hearings were held by the Senate Patents Committee and action was deferred in the Senate December 15, 1942. Congress adjourned shortly after this, without taking any further action on the legislation.

In the 78th Congress, H.R. 82 was introduced January 6, 1943. Hearings were held by the House Committee on Patents on April 7, and 8, 1943. This bill was reported to the House June 25, 1943, and passed the House June 28, 1943, under suspension of the rules. In the Senate, H.R. 82 was referred to the Committee on Patents, and Subcommittee hearings were held November 15 and 16, 1944. The bill was reported in the Senate December 4, 1944, with amendments. Action was deferred in the Senate December 14, 1944, and the bill was not reached again for consideration before the expiration of the Congress shortly thereafter.

The present Lanham Bill, H.R. 1654, was introduced January 22, 1945, in the 79th Congress and passed the House March 5, 1945, under suspension of the rules. In the Senate, H.R. 1654, the pending bill, has been referred to the Committee on Patents and action by the Senate is expected soon after the bill is reported by that committee.

In general, the Lanham Bill, if enacted as a law, will tend to recodify all Federal provisions relative to trade-marks, which are presently widely scattered, and will bring our trade-mark statute into conformity with modern judicial determinations and modern business conditions.

Legal trends affecting trade-marks

by Robert P. Harvey

A trade-mark serves its owner to the extent that the public can and does use it to select the goods upon which the mark appears. Conversely, a trade-mark serves the purchaser when he can rely on its presence as a guarantee that he is purchasing the goods of a known manufacturer or goods having the characteristics he associates with that mark.

The courts have held that both the private interest of the manufacturer and the public interest of the purchaser in the integrity of a trade-mark are best protected by according the limited monopoly of a property right in the use of a given mark to the individual or corporation first using it in a manner to satisfy that dual purpose. It is the existence, or extent, of such exclusive right that is called in question in nearly every suit involving trade-marks.

Modern manufacturing, merchandising and advertising methods and practices are changing the trade-mark environment. The public is faced with a greater variety of articles emanating from a common source, a greater diversity of articles being sold through the same trade channels and a greater geographical distribution of trade-marked goods. Through radio and national magazine advertising, public knowledge and recognition of a trade-mark and the article that carries it may become nation-wide long before a nation-wide distribution of the article itself is achieved. In this wider, more competitive market the area of possible trade-mark conflict is obviously increased.

In general, the courts base their judgments concerning the possibility of confusion of the public on an algebraic equating of the factors: 1) the similarity of the marks, 2) the similarity of the goods on which the marks are used, and 3) the degree of discrimination exercised by the purchasing public.

In every case the burden of persuasion is heavy on the later comer. Logically, and as is evident from the decisions cited at the close of this article, the result of the application of this formula under present-day conditions is a tendency to broaden the scope of the exclusive rights which the trade-mark owner enjoys. It seems inevitable that this tendency will become more marked, and it may result in a re-examination by the courts of the basis on which exclusive trade-mark rights are founded. Such re-examination is directly suggested by Judge Frank of the Second Circuit Court of Appeals in his concurring opinion in *Standard Brands, Inc.* v. *Smidler*, cited below.

Frequently the decision as to whether to extend the use of an established mark to additional products, or to select a new mark for the new product, requires a nice balancing of legal and commercial expediencies. The same or very similar marks may have become established by different users on what were once considered nonconflicting lines of merchandise but are now within the normal field of expansion of each user. To permit expansion by both users means inevitable confusion; to permit an expanded use by one alone also leads to confusion, although in a lesser degree. Even restriction of each to its original line does not remove the possibility of eventual confusion, and such restriction lessens the value of both marks. Court determination of such a controversy frequently results in a commercially unsatisfactory compromise.

The use of a different mark for each product has an unquestioned commercial appeal, particularly in packaged products. This practice lends itself to effective magazine and radio advertising by associating the mark with the characteristic qualities of the specific product. Commercial advantages may well outweigh the legal hazards which may arise through too close an association of the mark by the public with the product, regardless of its source. This class of mark seems particularly within the bombsight of a re-examination of the trade-mark concept.

No amount of advertising can give trade-mark standing to a word or symbol inherently incapable of trade-mark significance. However, if properly directed, advertising, intended primarily to promote sale of a product, can at the same time materially help to build a strong legal foundation for a sound, carefully chosen trade-mark. In addition to a distinctive trade-mark, many packaged products make a bid for public recognition and selection through the distinctive appearance of their label, wrapping or container. The dress of a package may be so distinctive that the purchaser does not bother to look for the name or trade-mark on the package before making his purchase. The scope of possible novelty in design is so vast that there is little excuse for conflict in this field. In many cases distinctions in the dress of the goods have helped to resolve doubts as to similarities in the trade-marks.

It should be borne in mind that the ultimate issue in any trade-mark case is the question of probable confusion of the public. Persuaded that confusion is likely, the courts will qualify the technicalities of prior decisions to meet the facts of the case before them. This is illustrated in the RCA case cited below.

The Siegel case clearly indicates the need for care in the "coining" of trade-marks to avoid misdescription.

Marks held confusingly similar

SEASON SKIPPER and SEASONAIRE: The first was used on overcoats and topcoats, the latter on clothing of various kinds, including overcoats. *C. B. Shane Corp.* v. *Desmond's* (CCPA) 60 USPQ 196.

SANI-FLUSH and TOILET-SAN: Both marks were used on porcelain cleaning powder. The court held "San" to be the

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distinctive feature of each mark, and confusion probable. Evidence that during 15 years concurrent use witnesses never knew of confusion was held of little probative force. *Hygienic Products Co.* v. *Huntington Laboratories, Inc.* (CCPA) 60 USPQ 205.

LIFE-CAP and VITACAP: The marks were used, respectively, on retreaded tires and retreading machinery. The court held the goods so interrelated as to be of the same descriptive properties, and the "meaning" of the marks identical. *Heintz* v. *American Tire Machinery Co.* (CCPA) 60 USPQ 575.

DIGISEALS and KAPSEALS DIGIFORTIS: Both were used on digitalis preparations. The latter mark had had long use prior to the commencement of appellee's use of "Digiseal." The court in holding confusion to be probable, noted the fact that appellee had also copied the green color of appellant's capsules as a "circumstance which lends support to the conclusion that applicant sought to profit from the goodwill built up by another." *Parke, Davis & Co.* v. *G. F. Harvey Co.* (CCPA) 60 USPQ 572.

ROX and ROCHE: The marks were held deceptively similar, both being used on salve. *Hoffmann-LaRoche, Inc.* v. *Kawerk* (CCPA) 65 USPQ 218.

BLEXIN and BETAPLEXIN: The trade-marks, both used on Vitamin B preparations, were held deceptively similar. The court considered that "Beta" being the Greek equivalent of the English "B," the word "Blexin" might well be termed a telescoped version of "Betaplexin." *International Vitamin Corp.* v. *Winthrop Chemical Co. Inc.* (CCPA) 35 T.M. Rep. 70.

Red band of adjacent touching diamonds infringes red crown and red band of connected half diamonds, both around the neck of a bowling pin. Judge Frank dissented because the evidence showed that those exceptional individuals who were interested in the source of the pins being used in a bowling alley insisted on inspecting the pins and while the marks might be confused at a substantial distance the ordinary user was not confused because he did not care which mark the pins carried. *Brunswick* v. *American Bowling & Billiards Co.* (CCA 2) 65 USPQ 148.

DENT-A-MIN and CYTAMIN: Both marks were used on medicinal preparations for diet deficiencies and both contained vitamins. The first-used mark—"Cytamin"—had been originally registered by the opposer for medicinal preparations prior to the discovery of vitamins, and its use later had been extended to the vitamin product. *McKesson & Robbins, Inc.* v. *American Foundation* (CCPA) 66 USPQ 252.

THIOSAN and THIO-ZIN: These marks were used, respectively, on agricultural fungicides used on putting greens, and on fungicidal powders used in locker rooms to prevent "athlete's foot" infection. The goods were not competitive and neither could be substituted for the other, but the court held that because both were fungicides the similarity of the marks might lead to confusion as to origin of the goods. *The Physicians' & Hospital Supply Co., Inc.*, doing business as *Ulmer Pharmacal Company* v. *Beyer-Semesan Co., Inc.* (CCPA) 66 USPQ 259.

Marks held not confusingly similar

CHEER UP and 7 UP or SEVEN UP: Both are used on bottled beverages but were held not confusingly similar. The court found that differences in labels and bottles further precluded confusion. *Seven Up Company* v. *Cheer Up Sales Co.* (CCA 8) 65 USPQ 237.

SKY MAIL and SKY-RITE: Both are used on air mail stationery. Plaintiff's "Sky-rite" accompanies a picture of an airplane and globe. The court held that "sky" was the only common feature and that purchasers using ordinary care would not be confused. *Averick* doing business as *Agency Paper Company* v. *Rockmont Envelope Co.* (D. C. Cole) 67 USPQ 229.

Goods held to be similar

RADIOS, RADIO ELECTRICAL APPARATUS and RAYON FABRIC: The marked involved was "RCA" which the court held had become so identified with Radio Corporation of America as to mean that company. With respect to the goods involved, the court said, "Both radios and knitted rayon materials are used in homes, and are often bought by the same class of people. Considering . . . (the public's association of "RCA" with Radio Corporation of America) . . . it would be very reasonable for purchaser upon seeing the "RCA" mark upon knitted rayon materials to conclude that appellant was engaged in, or was sponsoring the manufacture of such goods." *Radio Corp. of America* v. *Rayon Corp. of America* (CCPA) 60 USPQ 246.

VEGETABLE JUICE and DRY VITAMIN TABLETS: Plaintiff used "V-8" on a vegetable cocktail made up of a combination of eight vegetable juices. Defendant used the same mark on its dry vitamin tablets. Plaintiff's advertising stressed the vitamin and mineral content of its cocktail. Plaintiff also sold vitamin tablets but under a different mark. Judge Frank concurred in the majority opinion with reluctance, questioning whether under all the circumstances the "V-8" mark as used by plaintiff did not indicate to the public the particular product rather than its source, and questioned if the public were harmed, as a general proposition, if it got the kind and quality of product it expected. *Standard Brands, Inc.* v. *Smidler* (CCA 2) 151 F. 2d 34; 66 USPQ 337.

CONCENTRATED ORANGE JUICE and CONCENTRATED PRUNE JUICE: These goods have the same descriptive properties, despite different classification in the Patent Office. *California Prune and Apricot Growers Assn.* v. *The H. R. Nicholson Company*, Calif. Dist. Court of Appeal. 35 T.M. Rep. 196.

Goods held to be dissimilar

TEA, COFFEE, SALTED PEANUTS and FRUIT JUICES: The mark involved was "White House," and the court held confusion unlikely between these groups of products put out, respectively, by appellant and appellee, but restrained appellant from extension of the mark to vegetable and fruit juices. *Dwinell-Wright Co.* v. *National Fruit Products Co. Inc.* (CCA 1) 60 USPQ 304.

ANTI-FREEZE COMPOUND and RUBBING ALCOHOL GLYCERIN: These goods (sold under marks "Coldex" and "Goldex," respectively) were held not to have the same descriptive properties. While the court recognized that both alcohol and glycerin are used in anti-freeze preparations it held the differences in use and trade channels precluded confusion. Because the goods were found dissimilar the court did not pass on the similarity of the marks. *Goldsmith Bros.* v. *Atlas Supply Co.* (CCPA) 65 USPQ 378.

Territorial limits placed on marks

WILSHIRE: Plaintiff started use of mark on shirts in California in December 1934. Defendant started use of same mark in New York in January 1935. Defendant was first to extend sales through 45 states. Conflict developed when defendant began selling in California and when plaintiff extended its sales to Texas and Nebraska, previously reached by defendant. Court restricted use of mark by plaintiff to California. *Cohn-Goldwater Mfg. Co.* v. *Wilk Shirt Corporation* (CCA 2) 35 T.M. Rep. 79.

STAG: Plaintiff first used the mark for beer in 1908 and sold in twelve southern and midwestern States. Defendant began use of same mark on beer in Minnesota in 1938, its sales area being limited to a radius of 150 miles from the city of Duluth. Plaintiff never sold or advertised its beer in Minnesota, Wisconsin, Michigan or North or South Dakota. The court held that there could be no unfair competition and that equity will not protect a trade-mark against infringement unless there has been some user in the disputed territory. *Griesedieck Western Brewing Co.* v. *Peoples Brewing Co.* (CCA 8) 35 T.M. Rep. 211.

Misdescriptive marks

ALPACUNA: This case came to the court on a petition to review a "cease and desist" order of the Federal Trade Commission. It is of particular interest because it indicates an extension of the Commission's activities in the field of trademarks as distinguished from trade names and shows the increasing degree of finality which the courts feel compelled to accord the findings of the Board both as to the weight of the evidence and the inferences to be drawn from the evidence. "Alpacuna" had been used for 14 years as a trade-mark for overcoats made of a fabric consisting of a combination of alpaca, mohair and wool fibres on a cotton backing. The Commission's order was based on the testimony of certain witnesses that "cuna" indicated to them the presence of exceedingly rare "vicuna" fibres in the goods. It seems rather clear that had this case come up from one of the lower courts instead of from the Commission the order destroying this valuable trade-mark would have been modified to permit continued use of the mark with qualifying language. The Commission seems to take the position that a word, even in a "coined" association, cannot acquire a secondary meaning as a trade-mark by its use as such. *Jacob Siegel Co.* v. *Federal Trade Commission.* 150 Fed. 2d 751.

Patent review

by Harold A. Levey

In the following list, recent U. S. patents pertaining to the packaging industry are classified according to general subject matter, so that all new patents relating to each of the various facets of packaging may be found together. For example, all types of applicators, including daubers, brushes and droppers, will be found under "Applicators." Within each classification, the entries are arranged by patent number, and the specific subject of each patent is included.

In the monthly *U. S. Patent Digest* department of MODERN PACKAGING magazine have appeared comprehensive abstracts of the patents. Months in our list refer to 1945 issues where abstracts appear.

Copies of any of these patents may be purchased from the U. S. Patent Office, Washington, D. C., for 10 cents per copy, in currency, money order or certified check. When copies are ordered, it is essential that patent numbers be given.

Adhesives

Adhesives, starch, glue, casein resins, cellulose derivatives, and rubber:

2,370,044—Rubber adhesive (April)
2,372,666—Adhesive starch composition (June)
2,376,854—Cement (July)
2,378,927—Silicate cement (September)
2,382,731—Adhesive (October)

Applicators

Applicators, daubers, brushes, cosmetic holders, droppers, etc., made of metal, glass, bristle and rubber:

2,362,120—Cosmetic case (January)
2,363,367—Lipstick display and sample cabinet (January)
2,366,009—Vanity case or compact (March)
2,368,044—Lipstick holder (March)
2,368,045—Cosmetic holder (March)
2,368,918—Vanity case (April)
2,368,997—Lipstick holder (April)
2,371,808—Lipstick holder (June)
2,372,969—Compact case (June)
2,375,027—Cosmetic container (July)
2,379,105—Lipstick holder (September)
2,386,417—Lipstick holder (December)
2,387,213—Pour-out finishes for containers (December)

Bags

Bags, envelopes and liners made of paper, plastic, metal foils, asphalt and wax coatings:

2,362,459—Infusion package and its manufacture (January)
2,362,460—Infusion package and its manufacture (January)
2,363,926—Bag closure (January)
2,363,957—Envelope or container (January)
2,363,971—Ventilated shopping bag (January)
2,364,543—Forming siftproof bag closures (February)
2,364,575—Soap package (February)
2,364,711—Envelope (February)
2,364,886—Paper bag (February)
2,365,159—Container (February)
2,365,303—Garment bag (February)
2,365,556—Prophylactic package (February)
2,366,163—Filling spout (February)
2,367,440—Self-sealing paper envelope (March)
2,369,060—Wave-set envelope (April)
2,369,716—Bag closure (April)
2,370,079—Bag and method of making same (April)
2,370,226—Bag construction (April)
2,370,417—Shipping bundle for rail anchors (April)
2,371,135—Document package (May)
2,372,008—Making of bags and envelopes (May)
2,372,805—Container fastening means (June)
2,373,010—Bag closure (June)
2,373,285—Container (June)
2,373,340—Bag and method of filling (June)
2,374,026—Envelope construction (June)
2,374,793—Method of fluid-tight packaging (July)
2,374,798—Envelope (July)
2,375,544—Packing bag (July)
2,376,256—Packaging method (July)
2,377,005—Automatic bottom bag (August)
2,377,103—Method of fabricating containers (August)
2,378,503—Sewed double side-seam bag (August)
2,378,665—Suit cover and carrier (August)
2,379,657—Package (September)
2,379,846—Perforation of sheet material by electrical methods (September)
2,380,913—Art of packaging (October)
2,381,850—Method of making bag bodies (October)
2,385,531—Package (November)
2,385,532—Package (November)
2,385,533—Package (November)
2,385,534—Package (November)
2,385,535—Package (November
2,385,647—Bag (November)
2,386,933—Sheet folding (December)
2,387,059—Seat-cover package (December)

Bottles

Bottles, jars, jugs, and vials, made of glass, plastics and paper:

2,362,150—Self-closing bottle (January)
2,365,737—Package and closure (March)
2,365,947—Nursing bottle (March)
2,366,053—Containers for implantation tablets (March)
2,367,371—Bottle collar (March)

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2,367,908—Conjoint bottle mouth and stopper (March)
2,370,820—Dispensing bottle (May)
2,378,205—Bottle (August)
2,379,562—Nursing bottle (September)
2,380,395—Sealed package (October)
2,380,396—Sealed package (October)
2,384,084—Container for corrosive liquids (November)
2,384,099—Container for corrosive substances (November)
2,385,648—Double container (November)
2,385,924—Glass-lined container for corrosives (December)
2,385,954—Glass tank (December)
2,387,573—Nursing unit (December)

Boxes

Boxes, cartons and crates, made of paper, fibreboard, corrugated board and wood:

2,361,923—Box (January)
2,361,926—Package, container and blank (January)
2,361,984—Telescopic box (January)
2,362,181—Shipping or mailing container (January)
2,362,942—Pour-spout carton (January)
2,362,995—One-piece handled bottle carrier (January)
2,363,425—Method of making paperboard containers (January)
2,363,836—Carton (March)
2,363,950—Milk bottle carrier (January)
2,364,073—Folding handle for container (February)
2,364,267—Carton (February)
2,364,364—Package (February)
2,364,439—Reclosing carton (February)
2,364,576—Siftproof package and side seam (February)
2,364,650—Bottleholder (February)
2,364,651—Bottleholder (February)
2,364,678—Package (February)
2,364,705—Basket structure (February)
2,364,753—Bottle container (February)
2,364,829—Box (February)
2,364,916—Package (February)
2,364,943—Container (February)
2,365,191—Container for pencil fillers (February)
2,365,261—Carton (February)
2,365,333—Cardboard carton (February)
2,365,887—Box (March)
2,366,304—Container (February)
2,366,419—Box (February)
2,366,557—Cellular paperboard container (February)
2,366,602—Paperboard container (February)
2,366,770—Collapsible container (March)
2,366,819—Container (March)
2,367,008—Shipping container (March)
2,367,066—Carrier for containers (March)
2,367,084—Razor blade carrier (March)
2,367,345—Protective package (March)
2,367,410—Carton corner construction (March)
2,367,417—Antiseptic package (March)
2,367,419—Process for making containers (March)
2,367,476—Box (March)
2,367,477—Method of making containers (March)
2,367,520—Moistureproof container (March)
2,367,675—Container (March)
2,367,705—Tubular container (March)
2,367,706—Extensible dispensing container (March)
2,367,717—Carton (March)
2,367,780—Carton (March)
2,368,203—Carrier carton (March)
2,368,534—Cardboard receptacle (March)
2,368,553—Greaseproof folding box (March)
2,368,753—Package for radio tubes (April)
2,368,797—Package (April)
2,368,864—Carton (April)
2,368,920—Paper article and method of forming (April)
2,369,012—Container and method of making (April)
2,369,013—Container and method of making (April)
2,369,099—Shipping container (April)
2,369,385–2,369,392—Hinged cover container (April)
2,369,654—Paper receptacle (April)
2,369,884—Match book cover (April)
2,370,419—Gasproof container (April)
2,370,680—Container and method of making (May)
2,370,749—Interchangeable typewriter carton (May)
2,370,927—Container cover and attachment (May)
2,371,271—Blasting cap package (May)
2,371,312—Bottle carrier (May)
2,371,317—Bottle carrier (May)
2,371,369—Container (May)
2,371,404—Submersible container (May)
2,371,471—Bottle carrier (May)
2,371,557—Spectacle case (May)
2,371,578—Nested food-carrying equipment (May)
2,371,630—Cartridge container (May)
2,371,640—Automatic release aerial delivery container (May)
2,371,663—Crate (May)
2,371,667—Method of covering containers (June)
2,372,025—Match book (June)
2,372,181—Container (May)
2,372,182—Container (May)
2,372,294—Ornamental box (May)
2,372,312—Box or container (May)
2,372,352—Container (May)
2,372,452—Hermetically sealed package (May)
2,372,708—Package container (June)
2,372,836—Match holder and matches (June)
2,372,859—Package for solder (June)
2,373,408—Container handle (June)
2,373,423—Box (June)
2,373,701—Carton (June)
2,373,708—Application of closure to container (June)
2,373,730—Self-locking container (June)
2,373,851—Bottle carrier (June)
2,373,977—Foldable box (June)
2,374,005—Interlocking box (June)
2,374,006—Carton (June)
2,374,153—Basket (June)
2,374,160—Hatbox (June)
2,374,177—Container (June)
2,374,222—Ammunition package (June)
2,374,346—Container (June)
2,375,056—Partitioned bottle carrier (July)
2,375,087—Swing package and swing seat (July)
2,375,088—Hairspring container (July)
2,375,248—Container spout (July)
2,375,266—Combined spoon and lid for containers (July)
2,375,631—Bottle carrier (July)
2,375,645—Dental plate container (July)
2,375,647—Match book (July)
2,375,700—Ventilated shipping box (July)
2,375,809—Container (July)
2,375,843—Collapsible shipping and display carton (July)
2,375,993—Shell carrier liner (July)
2,376,530—Receptacle (July)

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2,376,660—Method of reinforcing box corners (July)
2,376,904—Paper container (August)
2,377,117—First aid kit (August)
2,377,118—Package (August)
2,377,125—Shipping box (August)
2,377,358—Container and method of making (August)
2,377,471—Container (August)
2,377,472—Carton or container (August)
2,377,520—Bottle carrier (August)
2,377,533—Container (August)
2,377,602—Carton (August)
2,377,603—Carton (August)
2,377,604—Carton (August)
2,378,224—Crate (August)
2,378,267—Case (August)
2,378,470—Container and method of sealing (August)
2,378,505—Collapsible crate (August)
2,378,750—Paper container (August)
2,378,920—Packaging rosin (September)
2,378,932—Package for furniture (September)
2,379,031—Carrying case (September)
2,379,043—Container (September)
2,379,053—Case for measuring instruments (September)
2,379,665—Folding box (September)
2,379,726—Folding box (September)
2,379,853—Powder box (September)
2,380,052—Jewelry box (September)
2,380,372—Portable container for compressed gases (October)
2,381,026—Lined carton (October)
2,381,067—Container (October)
2,381,508—Shipping container (October)
2,381,543—Carton partition means (October)
2,382,143—String binder assemblage and package (October)
2,382,202—Collapsible cellular carton (October)
2,382,240—Carton (October)
2,382,308—Carton and package (October)
2,382,368—Package (October)
2,382,378—Easy opening reclosable container (October)
2,382,536—Package for liquid material and container (October)
2,382,573—Container (October)
2,382,597—Shipping container and dispenser (October)
2,382,819—Container (October)
2,382,891—Shipping and display container (October)
2,383,726—Container (November)
2,383,728—Package (November)
2,383,853—Container (November)
2,384,076—Carton (November)
2,384,480—Bottle carrier (November)
2,384,559—Collapsible box structure (November)
2,384,718—Handle for container (November)
2,384,810—Container (November)
2,385,407—Packing box for heat treatment (December)
2,385,898—Snap-down flat-folded container (December)
2,386,416—Tablet and means for packaging (December)
2,386,546—Container for blasting caps (December)
2,386,859—Bottle carrier (December)
2,386,905—Carton and carton blank (December)
2,387,184—Cover construction for containers (December)
2,387,270—Container (December)
2,387,272—Method of forming cardboard boxes (December)
2,387,314—Carton (December)
2,387,325—Container (December)
2,387,326—Means for packaging berries (December)
2,387,329—Container with handle (December)
2,387,392—Method of constructing containers (December)
2,387,482—Box (December)

Cans

Cans and drums made of metal, fibreboard, plywood:

2,362,821—Key opening metal container (January)
2,362,845—Container structure (January)
2,362,846—Sheet metal container (January)
2,362,862—Paper container for fluids (January)
2,364,216—Cover for milk delivery can (February)
2,364,234—Container and method of making (February)
2,365,099—Portable container (February)
2,365,100—Key opening container (February)
2,365,112—Rip strip container (February)
2,369,188—Container (April)
2,369,921—Fuel container (April)
2,369,975—Fibre container (April)
2,370,081—Key for opening cans (April)
2,370,132—Container (April)
2,371,194—Container (May)
2,371,586—Sheet metal container and closure (May)
2,372,740—Cylindrical container (June)
2,375,122—Knock-down hogshead (July)
2,375,621—Can (July)
2,375,632—Container and closure with opening means (July)
2,376,064—Flask or jug liner (July)
2,378,126—Container (August)
2,378,128—Container (August)
2,378,159—Storage tank (August)
2,378,161—Container (August)
2,378,521—Container (August)
2,378,622—Safety razor case (August)
2,379,679—Metal box (September)
2,379,680—Metal box (September)
2,381,385—Method of constructing containers (October)
2,381,386—Method of making containers (October)
2,381,460—Method of producing can bodies (October)
2,382,035—Container (October)
2,382,083—Cover lock for can (October)
2,384,042—End seam for metal container (November)

Closures

Closures, corks, crowns, caps and stoppers made of glass, wood, metal, paper and plastics:

2,361,507—Bottle cap and manufacture (February)
2,363,352—Closure for paper container (January)
2,364,126—Receptacle closure (February)
2,364,307—Closure for collapsible tube (February)
2,367,317—Closure (March)
2,367,443—Process of forming end closure (March)
2,367,739—Cap closure (March)
2,367,883—Bottle closure (March)
2,369,895—Closure construction for metallic containers (April)
2,370,018—Container and closure (April)
2,370,732—Bottle stopper (May)
2,371,296—Means for venting milk cans (May)
2,371,372—Secondary closure for beverage bottle (May)
2,371,900—Closure cap (May)
2,372,156—Glass screw cap (May)
2,372,227—Closure (May
2,372,381—Receptacle and closure (May)
2,372,385—Closure setting mechanism (May)
2,372,725—Plastic bottle cap (June)

XUM

2,373,380—Clasp for envelope (June)
2,373,397—Container and closure (June)
2,373,434—Removable bottle cap (June)
2,373,481—Folding metal chicken crate (June)
2,373,847—Coated foil closure (June)
2,374,143—Combined bottle cap and stopper (June)
2,376,790—Closure (July)
2,376,899—Sealing facing and closure (August)
2,376,909—Screw closure (August)
2,377,274—Ampul (August)
2,377,402—Cap (August)
2,378,683—Receptacle and closure (August)
2,379,959—Hood closure cap (September)
2,380,443—Closure hold-down spring clamp for jars (October)
2,380,825—Closure for nonrefillable bottles (October)
2,381,207—Closure (October)
2,381,851—Method and apparatus for making hood caps (October)
2,382,051—Closure for containers (October)
2,383,747—Closure member (November)
2,383,760—Cover for paper containers (November)
2,385,114—Bottle closure (November)
2,385,255—Bag closure (November)
2,385,364—Attached filler cap (November)
2,385,597—Handle-defining closures for paper bags and the like (November)
2,385,847—Vacuum release stopper (December)
2,386,860—Bottle cap and release (December)

Coatings

Coatings, including lacquers, varnishes, enamels, sizing solutions, impregnating compounds, stiffening agents:

2,363,232—Protective coating for fruits (January)
2,364,614—Raw-state preserving process (February)
2,364,632—Wax emulsions (February)
2,364,651—Paper-coating composition (February)
2,364,946—Preparation of fresh fruit (February)
2,365,097—Preparing paper-coating composition (February)
2,365,728—Treatment of sausages and sausage casings (March)
2,369,766—Paper-coating composition (April)
2,370,268—Paper-coating composition (April)
2,370,341—Pigmented coating composition (April)
2,373,709—Coating composition (June)
2,375,752—Coating composition (July)
2,375,754—Coating composition (July)
2,377,989—Car lining (August)
2,379,065—Gelatinous material (September)
2,379,246—Corrosion-resistant protective coating composition (September)
2,382,443—Composition for lining can ends (October)
2,387,590—Post seal for battery container (December)

Devices

Devices and appliances for manually opening, closing, filling, emptying, applying and weighing materials to be packaged:

2,362,168—Registering device in box manufacture (January)
2,362,800—Display device (January)
2,363,908—Magazine for safety razor blades (January)
2,365,836—Chip holder (March)
2,366,432—Weighing apparatus (February)
2,366,438—Can punching and sealing device (February)
2,366,876—Toothbrush receptacle (March)
2,366,886—Capsule handling apparatus (March)
2,367,189—Means and method of applying labels (March)
2,367,393—Closure cleaning device (March)
2,367,899—Apparatus for filling carbonated beverage containers (March)
2,368,001—Paper feed device (March)
2,368,214—Means for sealing cartons (March)
2,368,262—Tape sealer (March)
2,368,520—Moistening device (March)
2,368,594—Packaging reel (March)
2,368,758—Container sealing device (April)
2,369,902—Container lifter (April)
2,370,005—Holder for toothbrush and dentrifice (April)
2,370,822—Container holder (May)
2,371,198—Binder (May)
2,371,406—Magazine for safety razor blades (May)
2,371,800—Paper fastener (June)
2,371,871—Tape-moistening device (June)
2,371,920—Knotless package tie (May)
2,372,351—Bottle holder (May)
2,372,742—Apparatus for moistening gummed articles (June)
2,372,746—Automatic apron fed hopper scale (June)
2,372,805—Container fastening means (June)
2,372,806—Wall connection for collapsible container (June)
2,374,645—Parcel carrier (July)
2,374,881—Display card and fastener holder (July)
2,374,893—Carrier for groups of articles (July)
2,375,769—Strap stretching and sealing apparatus (July)
2,376,487—Spectacle case (July)
2,376,887—Package cutter (August)
2,376,916—Label holder for boxes (August)
2,377,796—Apparatus for introducing liquids into containers (August)
2,378,112—Adjustable labeling device (August)
2,379,459—Temperature indicator (September)
2,381,764—Apparatus for charging and sealing containers (October)
2,383,761—Receptacle filling apparatus (November)
2,384,228—Automatic scale (November)
2,384,231—Apparatus for applying sheet material (November)
2,384,310—Jar fastener (November)
2,385,311—Loading device (November)
2,385,401—Egg carton setting-up device (November)
2,385,576—Clasping device for bags (November)
2,385,842—Spectacle case (December)
2,387,639—Display device (December)

Dispensers

Metering and pouring appliances:

2,362,609—Dispensing container (January)
2,362,835—Dispenser (January)
2,363,277—Adhesive tape dispenser and applier (January)
2,363,542—Display and dispensing stand (January)
2,364,231—Dispensing apparatus (February)
2,366,226—Dispensing container (February)
2,367,019—Dispensing package (March)
2,368,944—Fluid dispenser (April)
2,369,851—Towel dispenser (April)

2,371,150—Multiple loader for cup dispensers (May)
2,371,332—Dispensing container (May)
2,371,521—Dispensing container (May)
2,372,245—Label dispenser (May)
2,373,029—Mechanism for dispensing stacked articles (June)
2,373,092—Label and tape dispensing machine (June)
2,376,206—Blade dispensing container (July)
2,377,120—Dispensing container (August)
2,378,003—Dispensing container (August)
2,378,004—Dispensing container (August)
2,378,774—Cigarette case (August)
2,378,878—Container and method of forming same (August)
2,379,327—Dispenser (September)
2,383,771—Drink dispenser (November)
2,384,219—Assembling dispensing devices (November)
2,385,400—Dry-cell dispensing device (November)
2,385,509—Safety liquid dispenser (November)
2,385,600—Dispensing container (November)
2,386,408—Dispensing device (December)
2,386,877—Box opener and dispenser (December)
2,387,359—Soap dispenser (December)
2,387,640—Dispensing container (December)
2,387,699—Liquid dispensing means (December)

Inks

Printing compositions:

2,384,236—Printing ink (November)
2,385,613—Inks (November)
2,385,793—Printing ink (December)

Labels

Labels, tags and seals:

2,364,607—Adhesive label (February)
2,369,549—Printed label (April)
2,370,527—Index tab and supporting strip (April)
2,372,611—Seal tag (June)
2,382,736—Label (October)

Machines

Machines for filling, weighing, sealing, labeling and wrapping:

2,361,364—Cap-feeding apparatus (February)
2,361,365—Method and apparatus for sealing containers (February)
2,361,366—Apparatus for sealing containers (February)
2,361,942—Machine for making fibre container parts (January)
2,361,947—Soldering machine (January)
2,361,948—Assorting apparatus (January)
2,362,009—Method for use in applying closures to containers (January)
2,362,167—Supporting structure of beverage filling machines (January)
2,362,328—Labeling machine (January)
2,362,462—Bag closing machine (January)
2,362,791—Attachment for stripping foam from cans (January)
2,362,793—Machine for filling cans (January)
2,362,799—Method and apparatus for removing air from cans (January)
2,362,819—Package wrapping machine (January)
2,362,840—Container sealing machine (January)
2,362,841—Filled container steaming apparatus (January)
2,362,848—Can closing machine (January)
2,362,959—Bread wrapping machine (January)
2,363,014—Packing machine (January)
2,363,442—Pneumatic means for stripping paper (January)
2,363,543—Container filling apparatus (January)
2,363,704—Apparatus for sealing containers (January)
2,363,751—Wrapping machine (January)
2,363,939—Wrapping machine (January)
2,364,113—Apparatus for stacking powder grains (February)
2,364,380—Bottle capping apparatus (February)
2,364,400—Apparatus for filling (February)
2,364,523—Straight line capping machine (February)
2,364,552—Process and apparatus for the production of pellicles (February)
2,365,523—Device for sealing bags (February)
2,365,663—Strip cutter (March)
2,365,733—Match book assembling mechanism (March)
2,366,524—Hand bottle capper (February)
2,366,811—Packaging machine (March)
2,366,888—Wrapping machine (March)
2,367,085—Ampul filling machine (March)
2,367,247—Combined feed mechanism and weighing device (March)
2,367,387—Topping machine for canning (March)
2,367,884—Container fabricating machine (March)
2,367,896—Closure attachment means (March)
2,367,974—Slitting machine (March)
2,368,046—Machine for sealing containers (March)
2,368,213—Wrapping machine (March)
2,368,321—Weighing and sorting apparatus (March)
2,368,429—Machine for making packages (March)
2,368,519—Letter feed and separator unit (March)
2,368,624—Package filling machine (April)
2,368,645—Liquid sealing method (April)
2,369,205—Jacket forming machine (April)
2,369,484—Method and apparatus for making film (April)
2,369,540—Conveyor for filling machines (April)
2,369,557—Bottle conveyor (April)
2,369,563—Method and apparatus for filling envelopes (April)
2,369,753—Method of packaging sliced bread (April)
2,369,762—Apparatus for sealing containers (April)
2,370,072—Wrapping machine (April)
2,370,191—Filling and measuring apparatus (April)
2,370,292—Topping machine for canning (April)
2,370,418—Wrapping machine (April)
2,370,757—Container fabricating machine (May)
2,371,024—Tying machine (May)
2,371,026—Bottle packaging machine (May)
2,371,027—Bottle packaging machine (May)
2,371,040—Apparatus for weighing material (May)
2,371,046—Machine for setting up box blanks (May)
2,371,155—Machine and process for making films (May)
2,371,668—Cone jacket applying machine (June)
2,372,138—Sealing machine (May)
2,372,290—Method of filling and sealing metal containers (May)
2,372,457—Method for packaging beverages (May)
2,372,578—Bundle sealing machine (May)
2,372,885—Container sealing means (June)
2,372,899—Bottle filler and siruper (June)
2,373,171—Automatic cream expender (June)
2,373,381—Weighing machine (June)
2,373,649—Fruit bagger and weigher (June)
2,373,655—Wrapping machine (June)
2,373,838—Automatic weighing machine (June)
2,374,172—Wrapping machine (June)
2,374,268—Apparatus for filling cans (June)

XUM

2,374,698—Sheet feeding mechanism (July)
2,374,838—Mechanism for feeding wrappers (July)
2,375,141—Cap applying mechanism (July)
2,375,241—Sheet stacking machine (July)
2,375,424—Grid pasting machine (July)
2,375,805—Coating machine (July)
2,376,003—Packing apparatus (July)
2,376,076—Machine for wrapping butter (July)
2,376,138—Means for completing berry packaging (July)
2,376,253—Sealing machine (July)
2,376,289—Packaging apparatus (July)
2,376,355—Cigar machine-locking mechanism (July)
2,376,360—Mechanism for heat-sealing joints (July)
2,376,460—Sheet cutter (July)
2,376,470—Sheet cutter (July)
2,376,697—Bag making machine (July)
2,376,810—Packing apparatus (July)
2,376,838—Filling machine (July)
2,376,839—Method and apparatus for container construction (July)
2,376,904—Paper container (August)
2,377,130—Slitting and scoring machine (August)
2,377,687—Packaging machine (August)
2,378,306—Sheet feeding mechanism (August)
2,378,324—Packaging machine (August)
2,378,457—Closing mechanism for open end packages (August)
2,378,640—Apparatus for crowning containers (August)
2,378,796—Tray former for wrapping machines (August)
2,379,033—Tape cutting machine (September)
2,379,087—Bag handle attaching machine (September)
2,379,127—Box creasing and folding machine (September)
2,379,171—Paper-cutting machine (September)
2,379,230—Method for compacting and packaging milk powder (September)
2,379,258—Method for the manufacturing of tubular material (September)
2,379,342—Method of sealing filled tubes (September)
2,379,357—Sealing machine (September)
2,379,361—Sealing machine (September)
2,379,407—Packaging machine (September)
2,379,655—Machine for wrapping plastics (September)
2,379,859—Hinge folding, cutting and packaging assembly (September)
2,379,935—Packaging method (September)
2,379,937—Banding machine (September)
2,380,440—Method of making fibre container parts (October)
2,380,462—Can body necking machine (October)
2,380,624—Packaging apparatus and method (October)
2,380,758—Carton closing mechanism (October)
2,380,771—Apparatus for use in filling containers with liquid (October)
2,380,914—Art of manufacturing pouches (October)
2,380,918—Strip feed (October)
2,380,970—Stable packaged pharmaceuticals (October)
2,380,984—Method of canning (October)
2,381,078—Wrapping machine (October)
2,381,091—Method and apparatus for packing (October)
2,381,364—Pressing machine for box ends and covers (October)
2,382,175—Sealing, crimping and scoring rollers (October)
2,382,729—Fish packing machine (October)
2,382,930—Laminating apparatus (October)
2,383,507—Container filling system (November)
2,383,513—Can closing machine (November)
2,383,522—Apparatus for treating liquids (November)
2,383,523—Flattened can body manufacturing machine (November)
2,383,664—Wrapping machine (November)
2,383,700—Ampul filling machine (November)
2,383,781—Bottle filler and capper (November)
2,383,842—Bag forming machine (November)
2,383,975—Apparatus for displacing air from head spaces of filled containers (November)
2,384,021—Adhesive applying system (November)
2,384,052—Cap feeding apparatus (November)
2,384,492—Method and apparatus for packaging (November)
2,384,560—Article assembling apparatus (November)
2,385,004—Capping apparatus (November)
2,385,229—Method and apparatus for the production of bags (November)
2,385,233—Packaging machine (November)
2,385,429—Sealing machine (November)
2,385,583—Machine for sealing waxed bags (November)
2,385,598—Bag closing machine (November)
2,385,604—Machine for producing containers (November)
2,385,675—Tucking and folding mechanism (November)
2,385,751—Mechanism for use in package sealing strip applying (November)
2,385,897—Machine for continuous filling and packaging operations (December)
2,385,926—Apparatus for feeding and cutting material into definite lengths (December)
2,385,951—Sealing machine (December)
2,386,787—Closing machine (December)
2,386,797—Jar capping apparatus (December)
2,387,248—Cone marking machine (December)
2,387,273—Coating apparatus (December)
2,387,274—Method and apparatus for the production of bags (December)
2,387,439—Method of sealing containers (December)
2,387,452—Packaging apparatus (December)
2,387,566—Apparatus for connecting plies of thermoplastics (December)
2,387,585—Packaging machine (December)
2,387,605—Envelope fastener (December)
2,387,650—Apparatus for cutting strip material (December)

Paper

Paper, cellulosic sheet materials, fibreboard and corrugated board:

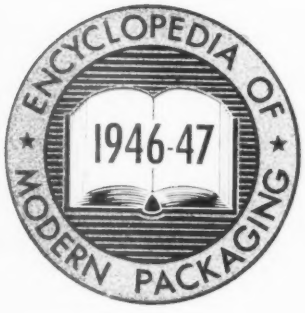
2,362,496—Double post card and return envelope (January)
2,362,595—Ice cream cone holder (January)
2,363,472—Mailing card (January)
2,364,297—Preformed wrapping for packages (February)
2,364,435—Manufacture of films (February)
2,365,020—Gummed sheet material (February)
2,365,704—Package wrapping (March)
2,366,575—Writing paper (February)
2,367,563—Wrapping for commodities (March)
2,371,858—Package wrapping (June)
2,371,985—Wrapped article and method of wrapping (May)
2,372,314—Heat-sealable waxed wrapping sheet (May)
2,373,524—Wrapper for cigarette packages (June)
2,374,767—Grease-resistant film (July)
2,376,777—Peelable heat-seal sheet material (July)
2,376,778—Heat-seal sheet material (July)
2,378,627—Egg packing material (August)
2,379,964—Adhesive sheet material (September)
2,380,368—Gum package (September)
2,380,762—Manufacture of sheet material (October)

Tapes

Tapes, ribbons, cords, straps, pressure-sensitive tapes made of paper, cellulose, fabric and metal:

2,364,001—Translucent pressure-sensitive tape (January)
2,373,634—Pressure-sensitive adhesive tape (June)





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XUM

The functions of paper in packaging

by R. G. Macdonald

The experiences of packagers during the war were an educational revelation. Prior to 1940, emphasis was largely upon design, and relatively few materials had to be considered. Emphasis in wartime packaging was largely upon utility, and the contents of the package had to be protected against such outside physical influences as water, water vapor and temperature changes. The armed services were confronted with a number of definite problems which led to the preparation of specifications for packaging all of the materials and implements that had to be shipped overseas and were likely to be subjected to the various elements.

In achieving these ends, cost was no object. Therefore, one might think that the problem could have been met by the simple procedure of packing most items in tin cans enclosed in the "Old Faithful" of the Marine Corps—the wooden box. Actually, it was not so simple. The Japs gained control of tin, steel became scarce and even lumber soon became less abundant.

In fact, when the field of materials was surveyed, only paper and paperboard remained as the available construction materials. These, then, had to be used. If they did not have all of the functional properties needed, such properties had to be added. Paper had covering power, and paperboard some structural strength as well. Both materials had the advantage of being made from fibres in suspension—and the properties of fibres, in suspension or in sheet form, can be improved by adding other materials in the form of fillers, impregnants, adhesives or coatings. These combinations carried the burden through the most critical days.

Inherent properties

Paper and paperboard, as such, have certain inherent properties, more than one hundred of which are measurable, and the Technical Association of the Pulp and Paper Industry has established about 70 test methods as standards. Thus, the properties in question can be measured accurately by physical or chemical means, and the results obtained are reproducible by a technician or by several technicians using the same methods in different laboratories.

Some of these measurable qualities are fibre analysis, bursting strength, tensile strength, basis weight, density, tear, folding endurance, opacity, bulk, brightness, moisture content, air permeability, water-vapor permeability, degree of sizing, saturating properties, printing ink permeation, stretch, surface wettability, wet strength, stability to heat, rigidity, stiffness, softness, moisture expansivity, creasing quality, water permeability, spectral reflectivity, hydrogen-ion concentration, water absorption, ink absorption, gloss, surface strength.

By chemical methods, it is possible to determine accurately the paraffin content, reducible sulfur, amount of coating on mineral coated paper, resin content, ash, casein, proteinaceous nitrogen materials, starch, mineral filler, water-soluble acid or alkali, alpha, beta and gamma cellulose, copper number, acid-soluble iron, arsenic, dirt, zinc pigments, titanium pigments, alkali-staining resistance, silver tarnishing, bacteria, pentosans, grease resistance, flame resistance, adhesiveness of gummed tape, puncture resistance and impact resistance of containers.

Additional properties

The paper converter must pay attention to the use requirements of his varied customers. Knowing the inherent properties of paper mentioned above, he is interested in obtaining the following properties:

1. Resistance to water, water vapor, grease and oils, acids and alkalis, solvents and chemicals, gases, scuffing and abrasion, insects, molds and micro-organisms
2. Tear and wet strength
3. Flexibility
4. Heat sealability
5. Pressure-sensitive adhesion
6. Protection of printed matter
7. Heat and pressure convertibility in molding processes
8. Electrical insulation
9. Decorative features

To attain these added properties, it is usually necessary to impregnate, coat, fill or laminate most papers. In time, it may be possible to obtain many of the properties desired by the converter by adding various substances to the fibrous suspension in the beater, preparatory to forming the sheet on the paper machine.

Since the end of war, the processor has been able to use a variety of substances in order to add desired properties to papers for special uses. Among the proteins and starches he has casein, glue, gelatin, soybean protein, gums and zein. The list of synthetic resins and rubbers and similar materials is increasing every day and includes urea-formaldehyde, phenol-formaldehyde, the vinyls, cellulose esters, drying oils and varnishes, lignin, melamine, polystyrene, shellac, rosin, natural gums and the polyamides. For use in lamination, the processor has films made from aluminum, lead and tin, as well as asbestos, parchment and cellophane and the materials which go under the trade names of Koroseal, Pliolite, Saran, Parafilm, etc.

The rubbers include the bunas, neoprene, natural rubber, Thiokol, polyethylene and butyl. In addition,

there are the animal, vegetable and mineral waxes and the asphalts.

The converter who considers these many functional materials must become thoroughly familiar with new techniques and machinery since he must deal with coatings, emulsions, impregnants, hot melts, calender applications, and so on. In designing new functional packages, he must select the materials, processes and equipment which will give him the desired results at a competitive cost.

Products packaged in paper

Civilian packaging uses of processed papers include asphalt-laminated crepe for bulk packaging of meat, trees and shrubs; can and jar closures; cigarette packages; food and candy wrappers; labels; milk bottles; packaging papers for asphalt, baked beans, drugs, motor oils, printing inks, shortening, silverware and countless other products.

The packager of such products as chemicals now has a wider choice of packaging materials than ever before. In general, his primary aims are utility and optimum cost. Like the Marine Corps, he formerly used a steel drum, a bottle or a wooden box. Now he must ask himself if a fibre container would not be much better for his needs. It may be less expensive, and it probably weighs less. It may even have an inner wrap or a type of functional construction which will give even greater protection at lower cost than his former methods.

General considerations

The problems of packaging probably do not lend themselves to a permanent solution. Each new product, destination or means of transportation introduces new factors for consideration. The primary consideration is to find a package which will do a thoroughly satisfactory job, even if it is necessary to overdesign in order to get a package which will perform all of the functions which may be required. Second only to this vital requirement is economy. This includes the original cost of the package, cost of handling in the plant, freight cost, and the ease and economy of handling by the customer who packages his product in it. More attention must be given by the packager to the engineering of packaging procedures from the production line to the customer's plant. Investment in packaging facilities is often as high as four per cent of the customer's total plant investment, and consequently the efficiency and economy with which the operations can be carried out may have an influence on his profits.

The bulk packager of chemicals and similar products has a choice of steel drums, fibre drums, multiwall paper bags, cloth and paper-cloth bags, fibre boxes, wooden barrels, metal foils, tank cars, plastics and other types of container. Our concern here is with containers made primarily of paper—multiwall bags, for example. These are made of the cheapest material available to the packager. The functional properties of flexibility and basic strength contribute much to the value of paper for this use. Other materials are superior in various ways, but their inherent specific properties can be attained in paper through coating, impregnating and laminating. In these ways, paper can be made resistant to gas, heat, acids, alkalis, oils, greases, sunlight, insect infestation, mildew, moisture and other hazards. By addition of certain chemicals, it can acquire high wet strength, and the addition of asphalt or resins will give it protective power against water. The addition of foils or certain films and special sealing compounds add the final protection.

Fibre drums

The fibre drum is largely a wartime development, but it probably will remain because of its relative economy and lightness. Much has been done to minimize its disadvantages in comparison with the steel drums—its lower strength and its lower resistance to chemical action and moisture. The addition of synthetic resins has broadened the use of fibre drums. Used as interior coatings, they render the drums more resistant to chemical action, grease, water vapor and other forms of contamination. Used on the exterior of drums, resins increase the attractiveness as well as scuff and weather resistance. Current research will lead to cheaper and more efficient coatings. Porosity and contamination have been decreased by the use of metallic foils and flexible transparent plastic films of the vinyl type. Special hard-finished paper stocks have also been developed to reduce porosity. Strength of the drums has been increased by the use of better and more waterproof adhesives.

Appearance

Because of the part that the package plays in merchandising, there will undoubtedly be a considerable trend toward novelty package design. Transparency will play an important part for a time, but eventually prime consideration will be given to strength and economy. All these can be attained with paper containers.

The availability of many new materials makes it possible to give attention to the attractiveness of packages, even for bulk shipments of manufacturers' raw materials. Postwar competition promises to bring prices to comparable levels and quality to a uniform high standard. A customer is apt to buy the most attractive material. And a good-looking package, particularly if it bears a trade-mark, uses a particular color scheme or has some other identifying mark of the supplier, will strengthen the impression of quality.

The next few years will undoubtedly witness a great competition between packaging materials. It is quite likely that most of the common materials will find acceptance, since it is possible to combine paper and paperboard in packages with most other materials, all of which offer functional advantages appealing to both the packager and the consumer.

XUM

Paperboard products for packaging

by J. D. Malcolmson

The principal constituents of woods, from which paper products are made, are cellulose and lignin, present in natural wood in about equal quantities. It is the tiny individual cellulose fibres, flexible and almost white in color, which are of interest to the papermaker. The lignin, a dark cement which binds the cellulose fibres together and gives wood its hardness and structural strength, must be removed before the paper is made. Only a few chemicals may be employed to cook out lignin economically without injuring the cellulose.

Classifications of wood pulp

Wood pulp is classified according to the manufacturing method by which it is produced. The two principal classifications are:

1. Groundwood or mechanical pulp
2. Chemical pulp

Groundwood pulp—Groundwood pulp is produced by grinding a peeled log against a revolving stone (natural or artificial). Because of the inferior strength, short length and stiffness of the fibres, and because of the impurity of the pulp, this constitutes the lowest quality of pulp manufactured. These inferior qualities are due to the retention of all of the lignin. Groundwood pulp is generally used in conjunction with some other longer-fibred pulp and finds its greatest use in the manufacture of newsprint, tissues, paperboard, and cheap magazine and pad papers. Picnic pie plates are 100 per cent groundwood. Newsprint is about 85 per cent groundwood. The yellowing and loss of strength of newsprint with age is due to the lignin in the groundwood. Occasionally, the wood is steamed before grinding, a process which results in a better separation of the fibres. The woods commonly used in making groundwood pulps are spruce, hemlock, balsam, fir, aspen, poplar and willow.

Chemical pulps—Chemical pulps are produced by cooking the wood with chemicals in large metal digesters under high heat and pressure. Before cooking, the wood is reduced to chips about one inch square. The chemical cooking serves to separate the cellulose (or pure fibres) from the lignin and other impurities. The impurities are dissolved in the cooking liquid and the degree of cooking determines the purity and also the physical characteristics of the pulp. Any of the chemical pulps may be bleached, a process which comprises whitening the pulps by the use of a bleaching chemical.

There are three principal kinds of chemical pulp:

Soda pulp—This is cooked with a solution of caustic soda (sodium hydroxide). It is a weak, soft, pure pulp used largely in book and magazine papers. It is seldom used in the manufacture of paperboard except for a small amount in the top liner of white patent-coated board. The woods commonly used are spruce, hemlock, aspen.

Sulfite pulp—An acid pulp, produced by a liquor which is a mixture of the bisulfites of calcium and magnesium. This pulp, which combines very high purity with good strength, is used in high-grade writing papers, book papers, folding boxboard, tissues, and also as the base for artificial silk and plastics. The "white patent-coated" surface of folding boxboard is mostly bleached sulfite. Woods used for this are the same as for soda pulp.

Sulfate pulp—An alkaline pulp produced by gentler cooking with a mixture of caustic soda (sodium hydroxide) and sodium sulfide. It is stronger but less pure pulp, containing enough lignin to add cementing matter. *Kraft pulp* is an under-cooked sulfate pulp which is the strongest but the most impure sulfate pulp. Considerable success has been enjoyed in bleaching rather well-cooked sulfate pulp to make a very strong and very white sheet, with better bending qualities than sulfite stock.

Bleached sulfate is often used for the top liner on corrugated facings or for sheet-lined board, but not for white patent-coated board. The principal woods used for this pulp are long-fibred conifers such as jack pine, southern pine, spruce, cypress, redwood and larch.

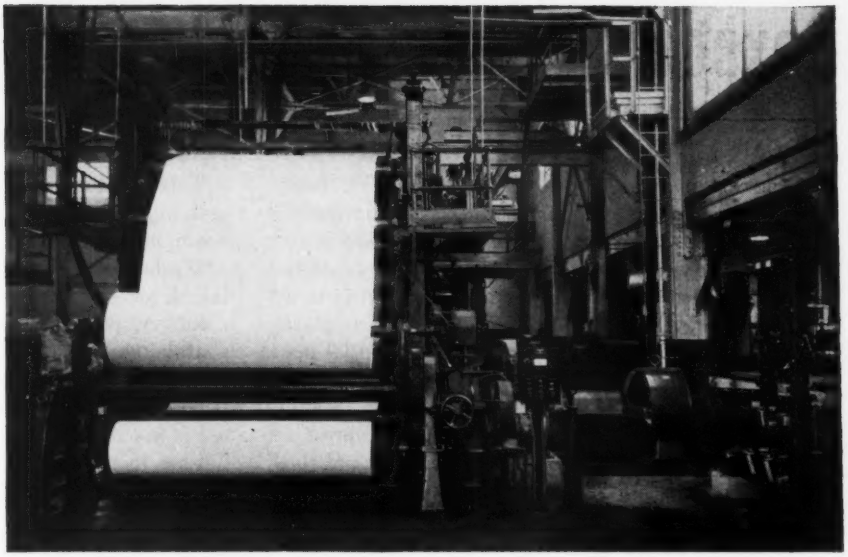
1—In this battery of Holland beaters at the National Pulp Products Co., fibres from pulp or waste paper are freed and prepared for further processing steps.

PHOTOS, COURTESY TECHNICAL ASSOCIATION OF THE PULP AND PAPER INDUSTRY



Principal paperboard products of wood pulp

Wherever possible, paperboard is made from old papers which contain the same fibres as new pulp but are cheaper. New pulp is added in sufficient proportion to bring the strength, bending quality and color up to the required standard.



2—After they are removed from the beater, the fibres and other components of paper are formed, pressed and calendered on papermaking machines. On equipment such as this, adjustable speed electric drives meet the requirements.

Because of the existence of various grades of waste paper and pulp, and the multicylinder construction of a board machine, it is possible to produce an almost infinite variety of boxboards.

Among the most common of these are the following:

Chip—Made up almost entirely of mixed papers. Occasionally stronger fibres are added to produce *test chip* or *bending chip*. The filler of most vat-lined paperboards is chip.

News—Made of old newspapers. The gray color is due to disseminated printer's ink. News is usually used as the inner surface of other boards (e.g., white patent-coated news back). Occasionally boards are made of *solid news*.

Manila—Name derived from manila rope fibres, but manila today contains no rope fibres. Boards and papers are still made of these fibres but the product is called "rope paper." Manila has come to mean a yellowish sheet containing 50 per cent or more of groundwood.

Nonbending manila—Composed of about $^2/_3$ groundwood, $^1/_3$ unbleached sulfite, plus some yellow dye.

Bending manila—The same except that the proportions are about half and half.

Bleached manila—The same as the two listed above except that the yellow dye is omitted and some blue and red are added so as to neutralize the yellow color of the groundwood.

White patent-coated—Usually has a top liner made of bleached sulfite pulp, unbleached sulfite pulp and some soda pulp. Waste paper from envelope factories, etc., known as *hard white shavings* and *soft white shavings*, is substituted for the more expensive sulfite pulps wherever possible. The filler is usually chip.

Manilas—Patent-coated and other grades can be colored in the beater (beater color) or on the calender (calender stain). They are then called yellow patent-coated news, orange calender stained manila, etc.

Mist boards—Tops are usually of news, or news and sulfite to which has been added a certain amount of dyed kraft fibres.

Solid boards—Usually have a more expensive filler than chip. Examples are *solid sulfite* and *solid manila* (groundwood). Solid boards often have a top liner different from the filler as, for example, *white patent-coated solid manila*.

Container boards—More attention paid to strength than to color whereas folding boxboards (listed above) are concerned with appearance and bending quality.

Test liners—Used on corrugated and solid fibre shipping containers and must meet official Mullen test.

Jute liners—Test liners made from reworked papers plus enough new pulp (usually kraft) to meet the required specifications on strength. Most of the new kraft pulp is concentrated on the outer skin or "top liner," and on the second layer or "under liner."

Kraft liners—Made of solid new kraft pulp, they are lighter in weight than jute but more expensive per ton.

Fourdrinier kraft liners—Made on a single wire screen and have no vat-lined formation. They are lighter in weight than *cylinder kraft liners*. Dry finish Fourdrinier kraft liners are lighter in weight than water finish Fourdrinier kraft liners.

Filled kraft liners—Intermediate between *jute* and *cylinder kraft* in that they contain $^3/_4$ or more of new kraft pulp. The term is indefinite.

Corrugating sheets—Usually 0.009 in. thick and made of a variety of raw materials, the most popular of which are wheat straw and solid kraft. *Mill straw* consists of high-grade paper stock chemically treated for the purpose of increasing rigidity.

None of the above sheets contain adhesive, their only lamination being the plies of the vat-lined sheets made on a cylinder machine. They can be combined with adhesives to other sheets to form an almost endless variety of combined products such as solid fibreboard, corrugated board, pasted chip, sheet-lined boards, caddy board, wallboard and similar products.

XUM

Boxboard—types and selection

by Grafton Whiting

Folding cartons and set-up boxes are made from boxboard which is manufactured on a multicylinder paper machine. The function of this machine is to draw a film or web of fibres from each cylinder (usually 5–8 cylinders) and, by subsequent pressure, to form a compact sheet. Each cylinder turns in a vat supplied with the raw stock (about 1 per cent fibre and 99 per cent water) from which the board is to be made. This supply may consist of fibres reclaimed from waste paper, or of virgin pulp fibres, or it may comprise a mixture of these, according to the specifications of the board to be produced. The first and last cylinders form the two outside liners, or surfaces, of the board, while the remaining cylinders produce the filler, or inner plies. Thickness of each ply may range from 0.002 in. upward.

Since any type of fibre may be furnished to the cylinders, and since each cylinder forms a part of the construction of the board, a wide variety of boxboards can be made on standard equipment.

Boxboard grades

Certain grades of board are in common use for folding and set-up boxes. These are made of different materials and come in different thicknesses, depending upon the size and style of the box and the exact packaging use to which it will be put.

The thickness or caliper is expressed in thousandths of an inch—termed "points." Thicknesses may vary over a range of 0.012–0.065 inch.

Gauge lists published courtesy of the National Paperboard Association.

Table I lists the grades, together with caliper range and, in general, the materials from which they are most commonly made.

Waste papers, chief source of raw material for boxboard, are sorted into many classes, each commanding a different price, according to the fibre content. Papers containing strong, white fibres bring the highest price and from there quality ranges downward to mixed papers, the lowest class. Pulp, although the average use is less in volume, is an important element in many finishes in producing the quality and surface effect required. Three kinds of pulp are in common use: sulfite, sulfate or kraft, and groundwood. These may be unbleached or bleached. Prices vary accordingly.

When the importation of European pulp was cut off in 1940, it was feared that the domestic and Canadian output would be insufficient to supply the market requirements. To meet this situation, the paperboard mills increased their usage of waste papers, particularly of the better grades, to substitute in part these reclaimed fibres for new pulp. American mills were, by this means, able to increase their output to such an extent that a serious shortage was avoided, but the pulp situation remained critical until July, 1945, when Swedish pulp again arrived in the United States. Although the substitution of waste papers has been somewhat lessened by these imports, the heavy demand for paperboard has kept waste papers in short supply. However, this does not affect the tabulation of the materials used, as shown in Table I, but it does explain the cause for variation in the amount of each consumed.

TABLE I—GRADES OF BOXBOARD

Grades	Caliper range in inches	Furnish									Price index
		Waste papers composed principally of					Pulp				
		Mixed papers	News	Ground wood	Sulfite fibres	Old cl. rs.	Sulfite	Kraft	Ground-wood	Clay	
Folding											
CHIP (BENDING)	0.012–0.050	x	x	..	..	x	..	..	..	..	110
MIST GRAY SUIT BOARD	0.020–0.040	x	x	..	..	x	x	x	..	..	130
MANILA LINED CHIP	0.012–0.05)	x	x	x	..	x	x	..	x	..	130
BLEACHED MANILA LINED CHIP	0.012–0.050	x	x	x	..	x	x	..	x	..	140
KRAFT BOARD	0.012–0.050	..	..	..	..	..	..	x	..	..	130
WHITE PATENT-COATED NEWS	0.012–0.028	..	x	x	x	..	x	..	..	..	160
CLAY-COATED BOARD	0.012–0.028	..	x	..	x	..	x	..	..	x	220
BLEACHED SULFITE BOARD	0.016–0.024	..	..	..	..	..	x	..	..	..	250
Set-up											
CHIP (NONBENDING)	0.016–0.065	x	x	..	..	..	..	..	..	..	100
NEWS VAT-LINED CHIP	0.016–0.065	x	x	..	..	x	..	..	..	..	105
FILLED NEWS	0.016–0.065	x	x	..	..	x	..	..	..	..	110
SOLID NEWS	0.016–0.065	..	x	..	..	..	..	..	..	..	115
WHITE VAT-LINED CHIP	0.016–0.065	x	..	x	x	x	x	..	x	..	130

NOTE: The proportion and selection of raw materials in a furnish may vary depending on availability of supply and quality required. Price index is based upon chip (nonbending) equal to 100%. The relation of other grades is only typical since the several materials entering into costs vary independently.

TABLE II—BOXBOARD GRADES USED FOR VARIOUS BOX TYPES

	Chip (bending)	*Mist gray suit board*	*Manila lined chip*	*Bleached manila lined chip*	*Kraft board*	*White patent-coated news*	*Clay-coated board*	*Bleached sulfite board*	*Chip (nonbending)*	*News vat-lined chip*	*Filled news*	*Solid news*	*White vat-lined chip*
BUTTER BOXES	..	..	..	..	..	..	..	a	..	..	..	..	..
CANDY BOXES	x	..	..	..	..	..	..	..	c	..	..	..	c
CEREAL CARTONS	x	..	..	x	..	x	..	x	..	x	..	..	..
CIGARETTE CARTONS	..	..	..	x	..	x	x	..	..	..	..	..	..
COSMETICS	..	..	..	..	..	..	x	..	..	..	x	..	c
DRUGS (BOTTLED)	..	..	x	x	..	x	x	..	..	..	..	..	..
DRIED FRUIT CARTONS	..	..	x	b	..	..	..	..	..	..	..	..	..
EGGS (LOCAL DELIVERY)	x	..	..	x	..	..	..	..	..	x	..	x	..
ENVELOPES (STATIONERY)	x	x	..	..	..	..	..	..	c	x	..	c	..
5-CENT CANDIES	..	..	..	x	..	..	..	..	..	x	..	..	..
FLORISTS' BOXES	x	x	..	..	x	..	..	..	c	..	..	..	..
FROZEN FOODS	..	..	..	..	..	..	..	b	..	..	..	..	..
HARDWARE	..	..	x	x	x	..	..	..	x	c	..	x	..
ICE CREAM	..	..	..	..	..	..	..	b	..	..	..	..	..
JEWELRY BOXES	..	..	..	c	..	..	x	..	..	..	x	..	c
LIQUOR (BOTTLED) CARTONS	..	..	..	..	..	x	x	..	..	..	..	..	..
MILK BOTTLES	..	..	..	..	..	..	..	b	..	..	..	..	..
SALT CARTONS	..	..	..	b	..	..	..	..	c	..	..	..	..
SHOE BOXES	..	..	x	..	..	..	..	..	c	c	..	..	..
SOAP (FLAKES)	..	..	..	a	..	a	a	..	..	..	..	..	..
SAUSAGES, BACON, ETC.	..	..	..	a	..	a	a	a	..	..	..	..	..
SUIT BOXES	x	x	..	..	x	..	..	..	..	..	..	..	..
STOCKING BOXES	..	..	..	..	..	..	..	..	c	c	..	..	..
TOOTHPASTE CARTONS	..	..	..	..	..	x	x	..	..	..	..	..	..
VEGETABLE AND FRUIT CARTONS	..	..	b	..	b	..	..	..	..	x	..	..	..

a—greaseproof, b—waterproof, c—lined with cover paper.

NOTE: The boxboard selected for any type of product may vary from a high to a low grade depending upon the service required of it, the price, and the degree to which the sales appeal in the appearance of the package is a factor in the merchandising policy.

Various chemicals, such as rosin and alum for sizing, are used in making boxboard. They prevent the penetration of moisture. Starch is used for hardening and for stiffening the product.

Loading material, such as clay, is also used. Emulsions, such as asphalt, for waterproofing, and dyes and pigments for procuring the desired color, are also employed. With these applied to the paper stock, any one or all of the plies may receive special treatment to suit requirements of the user.

Board types, color and finish

Solid boards—This is a general term indicating that the board is made of the same material throughout.

Filled boards—Board with inner plies of a stock different from that of the outer plies or liners.

Pasted board—Board made of two or more sheets of board or of board and paper pasted together by a subsequent operation.

Vat-lined board—Board made on a cylinder machine where the first or last cylinder vat is supplied with a quality of stock which is different from that supplied to the other vats.

Double vat-lined board requires that both the first and last vats contain different stocks.

Manila—Term used to indicate a color (yellowish) and appearance comparable to that formerly obtained when manila hemp (rope) was used.

Beater colored—Coloring material is added to the paper stock before entering the cylinder vat, thus impregnating the whole ply.

Calender colored (or stained)—Coloring material is applied to the surface of the board as it passes through the calender stack, thus coloring the top but not necessarily permeating throughout the ply.

Dry finish—Finish obtained when board passes through calender stack without receiving any special type of treatment.

Wet finish—Surface of the board is subjected to a water or steam bath in passing through the calender, which gives it a smoother finish. This is somewhat similar to dampening cloth before pressing.

Surface treatment—Treatment of the surface of the board may be made at the calender either before passing through the stacks or at some step in the operation. For example, silicate is applied to the board to prevent penetration of grease in the packaging of foods. Starch or other sizing is used to give a smoother finish for certain types of printing. Paraffin or wax is applied as a waterproofing agent where the board is to be used for the packaging of liquids or semiliquids.

Standards

Standard rules and regulations have been adopted by the National Paperboard Association, an organization representing folding and set-up boxboard manufacturers.

No. 1 Gauge List—Nonbending Boards

1. Plain strawboard
2. Plain chipboard
3. Filled wood pulp
4. Filled news board
5. Single news vat-lined chip
6. Single white vat-lined chip

Regular number 50 lb. bdl.	*Finish*				*Weight per M sq. ft.*
	1	*2*	*3*	*4*	
Quantity	*In.*	*In.*	*In.*	*In.*	*Lb.*
35	0.065	0.061	0.058	0.052	206
40	0.057	0.054	0.051	0.046	180
45	0.051	0.048	0.046	0.041	160
50	0.046	0.043	0.041	0.037	144
55	0.041	0.038	0.036	0.033	131
60	0.038	0.035	0.033	0.030	120
65	0.035	0.032	0.030	0.028	111
70	0.032	0.030	0.028	0.026	103
75	0.030	0.028	0.027	0.024	96
80	0.028	0.026	0.025	0.023	90
85	0.026	0.024	0.023	0.022	85
90	0.024	0.022	0.021	0.020	80
95	0.023	0.021	0.020	0.018	76
100	0.022	0.020	0.019	0.017	72
110	0.019	0.018	0.017	0.016	65
120	0.017	0.016	0.015	0.014	60

No. 2 Gauge List—Bending Boards

1. Single manila lined chip
2. Bleached manila lined chip
3. Double manila lined chip
4. Colored boxboard chip back
5. Bending chipboard
6. Colored suit box chip back
7. Mist color suit box chip back
8. Cracker shell board
9. Solid jute
10. Any combination with chip, news or pulp back

Regular number 50 lb. bdl.	*Finish*				*Weight per M sq. ft.*
	1	*2*	*3*	*4*	
Quantity	*In.*	*In.*	*In.*	*In.*	*Lb.*
40	0.052	0.049	0.047	0.045	180
45	0.047	0.045	0.042	0.040	160
50	0.042	0.040	0.038	0.036	144
55	0.038	0.036	0.034	0.032	131
60	0.035	0.033	0.031	0.029	120
65	0.031	0.030	0.028	0.026	111
70	0.029	0.028	0.026	0.024	103
75	0.027	0.026	0.024	0.023	96
80	0.025	0.024	0.023	0.021	90
85	0.023	0.022	0.021	0.019	85
90	0.021	0.020	0.019	0.018	80
95	0.020	0.019	0.018	0.017	76
100	0.019	0.018	0.017	0.016	72
105	0.018	0.017	0.016	0.015	69
110	0.017	0.016	0.015	0.014	65
120	0.016	0.015	0.014	0.013	60

No. 3 Gauge List—Pasted Chip

Regular number 50 lb. bdl.	*Finish*		*Weight per M sq. ft.*
	Rough	*Smooth*	
Quantity	*In.*	*In.*	*Lb.*
10	0.216	0.206	720
15	0.144	0.138	480
20	0.108	0.103	360
25	0.086	0.081	288
30	0.070	0.065	240
35	0.060	0.058	206

The basic facts for establishing the standards, and other information, were obtained from investigations of practices in large and small boxboard mills scattered over a wide area. Following this survey, conferences were held by makers of board, fabricators of folding and set-up boxes, and consumer organizations. As a result, a series of standard gauge lists was evolved together with a set of definitions which met with general approval. These gauge lists are identical with Simplified Practice Recommendation R44-36, entitled *Box Board Thicknesses* (United States Department of Commerce; effective December 31, 1936). Gauge lists are given in this article and the definitions are as follows:

Standard sizes—In all grades, a sheet 25 in. by 40 in., containing 1000 sq. inches.

Patent-coated or manila boards (see List 6) are also shown in sizes 24 in. by 36 in., containing 864 sq. in. and 28 in. by 44 in., containing 1232 sq. inches. The standard sizes are used as bases for all computations.

Standard package—In patent-coated or solid manila board, a ream of 500 sheets.

These grades are sometimes packed, for convenience, in fractions or multiples of a ream, depending upon the size of the sheet.

Bundle—A unit containing 50 pounds. The quantity of sheets varies with the size and the caliper, but the weight is fixed at 50 pounds.

Regular numbers—The quantity of standard size sheets (25 by 40) of boxboard necessary to make a bundle of 50 pounds.

Count—The quantity of odd-size sheets required to make a bundle.

For the standard size (25 by 40), the count would be identical with the regular number; therefore it has become the custom to use the term "count" to apply only to sheets of odd size, and "regular number" to sheets of standard size. The count for an odd-size sheet is found by dividing the area of the corresponding regular number by the number of square inches which are in the odd-size sheet.

Finish—Four standard finishes designated as Nos. 1 to 4 from lowest to highest. The degree of finish is regulated by the pressure exerted on the calenders under which the board passes. The pressure determines the density of the sheet. The resulting surface is incidental, but it becomes smoother as calender pressure is increased.

No. 1—Light pressure results in a rough surface and low density. It gives large sheetage for its weight; i.e., it gives greatest area to pound of board.

No. 2—Medium pressure, fair surface and sheetage. Popular for ordinary printing and general utility purposes.

No. 3—Heavy pressure, smooth surface and low sheetage. Used largely where better printing surface is required.

No. 4—Heaviest pressure, extra-smooth and slick surface, dense body and firm compact fibres. It has the lowest sheetage.

Rough, smooth—Where but two finishes are used, these relative terms designate light- or heavyweight board in caliper points.

Dimensions—Width in inches given first, then length. Width is the measurement across the machine, i.e., space between knives in the slitter. Length is always the measurement in the direction of the grain, i.e., the space between cut-offs.

Bending—Any board which, when properly scored and folded, shows no break in the outer fibres.

Gauge Lists 1 to 6 give in the first column the regular numbers or quantity of standard-size sheets in a bundle weighing 50 pounds. The figures in the other columns give the caliper (decimals of an inch) when made with the finish indicated.

Thus Gauge List No. 1, first line, column 1, shows regular number 35, meaning 35 standard-size sheets to the bundle. Column 2 gives the caliper of 0.065 in. as the thickness of No. 1 finish; column 3, 0.061 in. for No. 2 finish; and so on.

Gauge List 6 states the caliper in the first column, and to the right of it, the weight of a ream of 500 sheets. Three sheet sizes are listed with their corresponding weights. The weight per M sq. ft. is also shown.

Special surfacings

Boxboard is taken from the paper machine either in rolls or in sheets, is cut to specified size, and may be further processed to give a special type of surface. Additional processing may be continuous with the paper machine or treated in a separate division.

Clay-coated—Clay, with casein as an adhesive, is applied as a coating to boxboard and, with subsequent calendering, produces an excellent color and brightness. It is the highest standard grade of board and is used largely for the better quality of folding cartons.

Grained—An imitation oak, leather, marble, or other finish may be given to a boxboard by passing it through printing cylinders appropriately engraved.

Lined or pasted—Any boxboard may be pasted to another or lined with a plain or fancy cover paper, parchment, glassine or other material, either in roll or in sheet form. Properly prepared asphalt or other adhesives may be used to make the board practically waterproof. Pasted board may be built up to any desired thickness and made to serve a number of uses.

Table II shows the general box types and the grades of board from which they may be made. Such data are necessarily based upon averages, since box styles vary the same as styles in clothing, and poorer or better grades may be supplied to meet the desire of the buyer.

The war effort brought new problems to the industry. There was a demand for paperboard to be used as a substitute for other materials then on the "critical list." A box which would withstand hard usage and preserve its contents for use overseas was also needed. These problems were solved through the ingenuity and research of members of the industry and involved chiefly the use of certain chemicals and special applications to the board. Some of these war-developed uses will undoubtedly be continued for civilian needs but this will not alter the general composition of the grades of board nor the types of boxes made from them.

No. 4 Gauge List—Solid News Solid Wood Pulp

Regular number 50 lb. bdl.	*Finish*				*Weight per M sq. ft.*
	1	*2*	*3*	*4*	
Quantity	*In.*	*In.*	*In.*	*In.*	*Lb.*
40	0.061	0.058	0.053	0.049	180
45	0.054	0.052	0.048	0.043	160
50	0.049	0.047	0.043	0.039	144
55	0.045	0.043	0.039	0.035	131
60	0.041	0.039	0.036	0.032	120
65	0.038	0.036	0.033	0.030	111
70	0.035	0.033	0.031	0.028	103
75	0.032	0.031	0.029	0.026	96
80	0.030	0.029	0.027	0.024	90
85	0.028	0.027	0.025	0.023	85
90	0.027	0.025	0.023	0.021	80
95	0.025	0.024	0.022	0.020	76
100	0.023	0.022	0.021	0.019	72
110	0.021	0.020	0.019	0.017	65
120	0.019	0.018	0.017	0.015	60

No. 5 Gauge List—Pasted Solids News Board

Regular number 50 lb. bdl.	*Finish*		*Weight per M sq. ft.*
	Rough	*Smooth*	
Quantity	*In.*	*In.*	*Lb.*
10	0.233	0.196	720
15	0.156	0.130	480
20	0.117	0.098	360
25	0.094	0.078	288
30	0.078	0.065	240
35	0.066	0.056	206

No. 6 Gauge List and Ream Weight Table
Patent-Coated and Solid Manila Board

1. Patent-coated, solid manila back
2. Patent-coated, news back
3. Patent-coated, news center manila back
4. Patent-coated, chip back
5. Patent-coated, blue or color back
6. Solid manila board

Caliper of individual sheets	*Weight per 500 sheets*			*Weight per M sq. ft.*
	25 × 40 (1000 sq. in.)	*24 × 36 (864 sq. in.)*	*28 × 44 (1232 sq. in.)*	
In.	*Lb.*	*Lb.*	*Lb.*	*Lb.*
0.011	178	154	219	51
0.012	194	168	239	56
0.013	211	182	260	61
0.014	219	189	270	63
0.015	226	195	278	65
0.016	241	208	297	69
0.018	266	230	328	77
0.020	284	245	350	82
0.022	306	264	377	88
0.024	333	288	410	96
0.026	361	312	445	104
0.028	389	336	479	112
0.030	417	360	514	120
0.032	444	384	547	128
0.034	472	408	582	136
0.040	556	480	685	160

XUM

Folding boxes

by Richard E. Paige

The prime function of a folding box is to package adequately and economically. It offers advantages which are not to be compared to the set-up box. Each serves a different purpose, and when such advantages are thoroughly understood, it will be seen they offer no competition to each other.

Before a final decision is made, a packager's needs should be carefully analyzed to determine which type of box, folding or set-up, his product should use. This should be done *before* he calls in a designer for "surface" designing.

Generally, folding boxes are made of the lighter weight boards. They ship flat and are stored flat—a tremendous factor in large quantity production. There are countless machines for erecting, filling and closing folding boxes as well as for setting up the "cracker box" type of package used by bakeries and ice cream manufacturers.

For greatest all-around economy, the folding box is without competition. There are, however, many other considerations in present-day merchandising. Highly priced merchandise or articles which need glamorous backgrounds, for example, articles like perfumes, cameras, good tools, should be boxed in the heavier boards, and therefore set-up boxes are more appropriate for this purpose.

Another consideration is the fact that, in many production lines employing hand filling of boxes, the crew employed would have to be doubled to set up boxes as well as load them. Such production line problems can be settled in one of two ways.

First to be taken into account is that if space and help are available, the packer can usually make a little extra money by using folding boxes. There are many boxes which are virtually "set-up" boxes (pasted set-up), since they are shipped flat and pulled open with a single motion. If the space and help are not available, and if the quantities are moderate, then set-up boxes are far quicker to fill and close, and usually sturdier to ship.

To cover folding boxes by any general statement is almost as bad as to generalize about women. There are endless folding box types, from the simple tuck flap boxes used for cough drops to the elaborate display boxes in which dozens of articles are packed, shipped and displayed.

The illustrations on the following pages show certain standard types of folding box which are widely used, but they cannot include the infinite variety of special designs which have been developed for special uses. It is not necessary for a packer to try to fit his product into the types illustrated here when it may be wiser to seek a design which is custom-made for his particular requirements.

Considerations in ordering folding boxes

In an informative article of this type, it is the custom to give a list of things to specify when purchasing boxes. The list extends from the type of board to the type of adhesive. But anyone who needs this article as a guide is not a veteran box buyer. Then my advice is: don't *tell* your supplier or designer what you need, *ask* him! Through cautious investigation you will find that the type of folding box house which employs construction men, designers and experienced salesmen can help you to select a satisfactory package.

If you are uncertain of your needs, order conservatively, and disregard "unit price." Do not order a large quantity of impractical or unusable boxes just to get a lower unit price. Once you are completely satisfied by your new package, then learn its specifications to ensure uniformity in ordering.

The folding box is more than a thing of beauty and an appeal to your customer; it is part of your factory production line and therefore should never be purchased without an okay from the plant manager whose job it is to supervise the filling of the box.

Protective coatings, decorative coatings, waterproof boards and metallic linings are now available on folding boxes. Such boxes may be employed for specialized packaging jobs for which folding boxes could not be used a few years ago. That is why it is wiser for the user to consult his supplier rather than to assume the responsibility of specifying stock, construction, inks and adhesives.

Try to choose a supplier who seems to have specialized in boxes similar to those you require. Each manufacturer of folding boxes has had specialized experience. You will find that some manufacturers do a large "tonnage" business on long runs of soap and tobacco boxes. Others specialize in greaseproof cartons for bakery goods, and may even offer you the advantage of "split runs" with other bakeries. This can be of great financial advantage to you. Still others make bottle carriers and are equipped with certain automatic stitching machinery which gives them a great advantage over those folding box suppliers who would have to take the time to hand-stitch the carriers.

Some folding box manufacturers do their best work on small orders and value these short runs, whereas a "tonnage" house has equipment geared for large volume and does not solicit small orders.

This summary of folding boxes should help you to choose a supplier who will be suited to your needs. Today, more than ever before, your package is your salesman as well as the protector of your product. Time invested in developing a good package will pay you well.

Pictorial review of folding boxes

One-piece cartons for hand or automatic packing

1—Reverse-tuck carton. The most widely used of all carton styles for low-priced articles of all kinds. Easily formed by hand; may be adapted for automatic packing. Convenient to open and close; very economical in manufacture as sheets may be laid out with little waste. Not recommended for heavy contents which require means of locking the end tucks. Unsuited for powdery products, such as flour, salt and sugar, because not siftproof. Ready accessibility and low cost make this an ideal type for low-cost mass production products. (ST)

2—Variation of No. 1. The tuck ends are notched to afford a means of locking the flaps for not-too-heavy products. (PP)

3—Another variation of No. 1. Bottom flaps have the special locking side flaps known as the "Arthur lock," permitting use of this carton to contain bottle or jar. (US)

4—Double-tuck carton with tongue lock which makes this style usable as a mailing carton or for containing heavy articles. (CC)

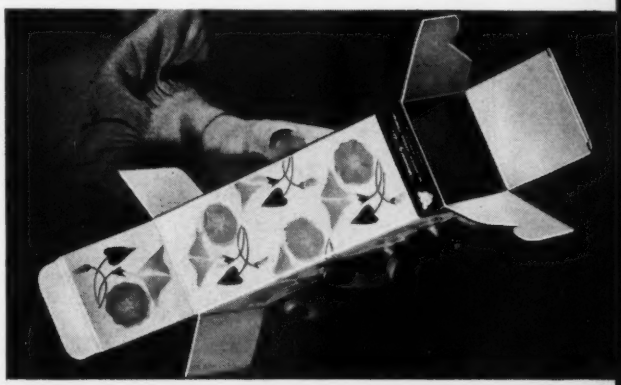
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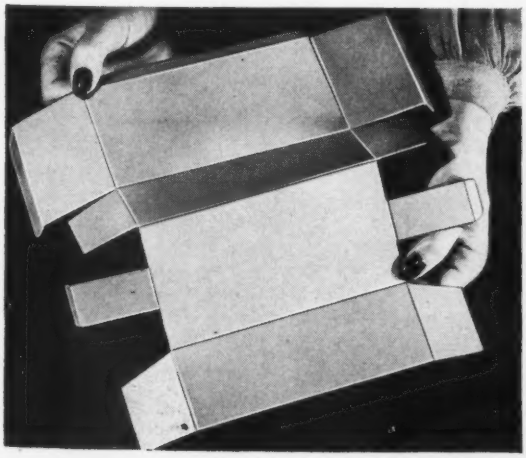
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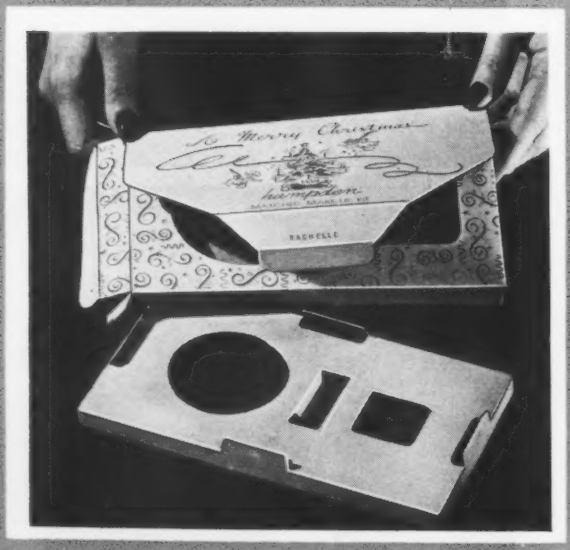
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6



7



8

5—Variation of the straight-tuck carton, with tapered or beveled sides and ends. Can be handled on special automatic packaging equipment. (RL)

6—Variation of the straight-tuck carton. End flaps are die-cut and scored in a manner to permit testing of contents (in this case a radio tube) without destroying the seal of the carton, thus preventing pilferage or tampering before purchase. (PP)

7—Straight-tuck-end carton in duplex or twin form. Suitable for such articles as optical goods and other products which are sold in pairs. (PP)

8—Variation of the straight-tuck carton. One side has been extended to form a panel or lid. Extra feature is a die-cut platform which fits inside of carton and holds contents in position. Platform has extended side walls which hold it firmly in place. (WF)

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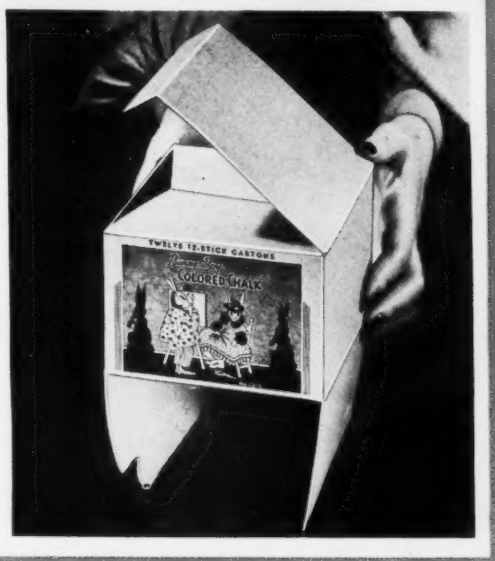
9—Carton with tuck-top and Greenleaf-lock bottom. Combines the convenience of an easily closing top with the safety of a securely locked bottom. The slight additional cost for the latter is worth while for heavy products. (PP)

10—Greenleaf-lock carton. Locks securely at both ends; widely used for bulky, heavy products. In larger sizes, may serve as bulk container for a number of individual units. (RL)

11—Carton with tuck top and Quikloc bottom. Top flaps have Arthur locks. Original style of interlocking bottom flaps, which is a patented construction, has many variations. (OB)

12—Carton combining tuck-end with solid seal. Has special hinge fold permitting consumer inspection in retail outlet. In process of filling, the solid seal is formed first, then comes the filling operation following which tuck end is closed. Best suited to automatic handling because of difficulty of glue-sealing by hand. (US)

9



10



11



12



XUM



13



14

13—Bellows-end carton. Forms a strong, tight closure by hand assembly. Web-end construction protects against accidental opening for such springy articles as inner tubes. Patented construction. (PP)

14—Reverse-tuck carton with transparent film window. Die-cut opening can be of any shape or size suitable for display of contents. (MK)

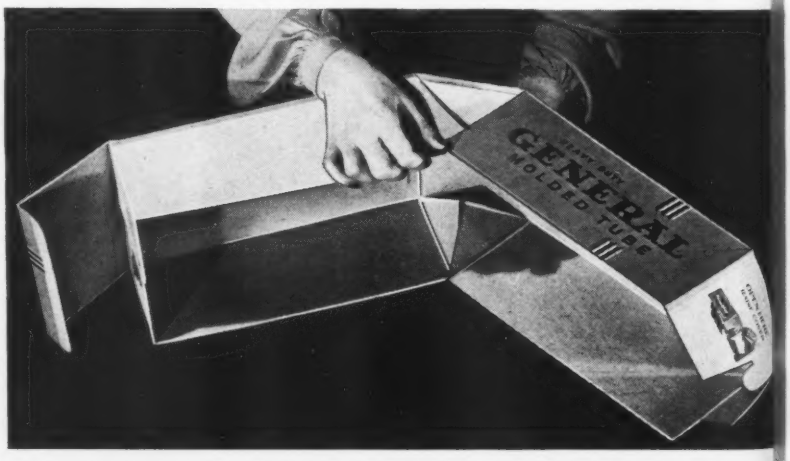
15—Folder-carton with three-catch Greenleaf lock and transparent window. This is a modification of the straight-tuck carton in which the locking tabs take the place of the conventional side gluing. This construction is suitable for products that require wrapping method of filling. (US)

16—"Simplifold" carton. A patented structure utilizing a bellows side closure, Arthur locks and tuck top. Suitable for heavy, awkward articles such as overshoes or inner tubes. (OB)

15

16





XUM

One-piece cartons for high-speed automatic packaging

17



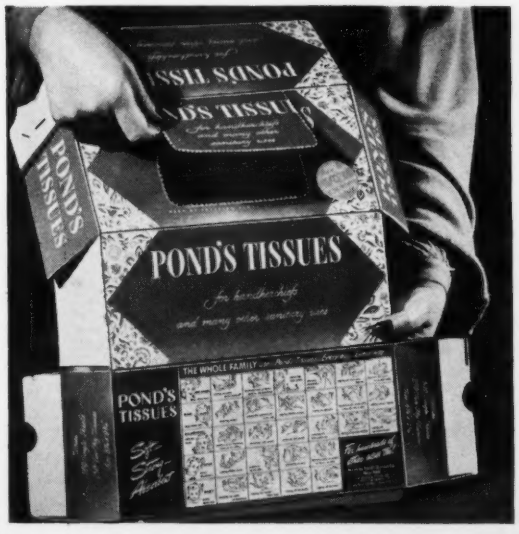
17—Seal-end carton. The most popular style of carton for automatic filling and sealing. Used for packaging cereals, sugar, salt, teas, coffees, spices, soap powders and many other products. Simple construction and economical layout make it comparatively inexpensive. (HD)

18



18—Seal-end carton with pouring spout. Same construction as No. 17 with additional features of a patented pouring spout which makes it possible to dispense contents conveniently. Pouring spouts vary as to position and structure. Some of these are patented, others represent trade custom. (UP)

19



19—Seal-end carton with end flaps as additional precaution against accidental opening. Face panel is perforated for easy dispensing of the contents. (OB)



20

20—Seal-end carton of unique parallelogram shape, attained by cutting the small inner end flaps at an angle. (OB)

21—Peters-lock carton devised for use on Peters machines for automatic forming and lining. Widely used for biscuits, crackers, lard, shortening, cheese, frozen foods. Adaptable for use on products produced in large volume. (HD)

22—Four-hook-catch carton for automatic forming, filling, closing and sealing. Developed especially for the frozen food industry. Complete package consists of inner liner, paperboard shell and outer printed waxed wrap, heat sealed. (WP)



21

One- and two-piece cartons for hand packing

23—One-piece collapsible carton. These cartons are glued in collapsible form by the cartonmaker and shipped flat to the user. They are quickly set up by pulling the side walls into an upright position. Can be furnished with a transparent cellulose window to allow visibility without opening—a most important factor in keeping food products fresh and clean. (OB)



22

23

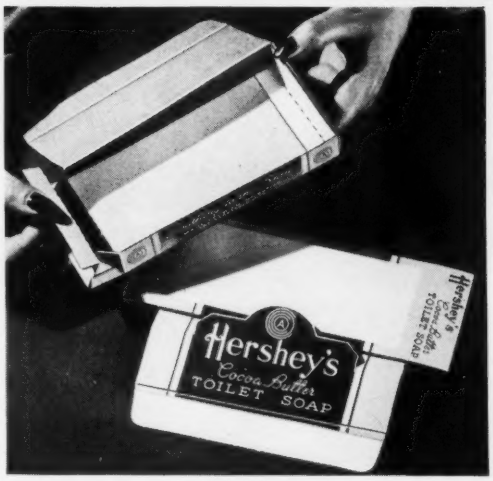




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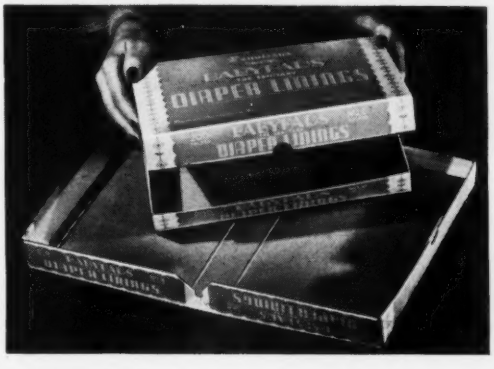
24—Two-piece collapsible carton. Variation of No. 23. Delivered with side walls outfolded. The two pieces fit together like a telescope box. (RL)

25



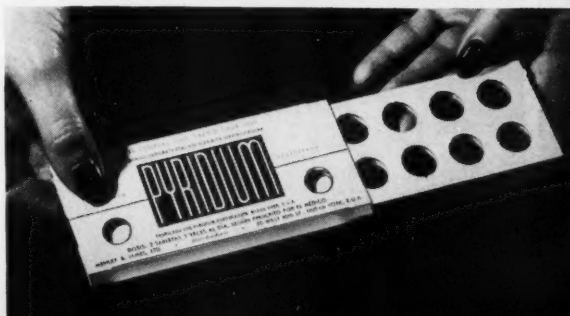
25—One-piece Simplex carton, originally patented. Has some of the advantages of both the folding and the set-up box. It combines rigidity, finish and strength of a set-up box with the low cost and shipping and storage convenience of a folding box. Adapted for hand packaging. Can be made with or without a display lid. (SP)

26



26—One-piece Simplex carton. This is a modification of No. 25. Shown open and in semiclosed position. Box folds in such a manner as to form a telescope style cover. (SP)

27



27—Tube and slide carton. This type usually consists of a folding tray, slide or shell which is inserted into a tube on which appears design and identity features. Access to contents is very convenient; this style is well suited for various small articles such as medicinal tablets, etc. for which it is a convenient pocket package. (WF)

XUM



28

28—Two-piece cracker caddy made in various patented forms. Bottom flaps lock securely together. Top is of one-piece collapsible construction suitable for bulk containers. (HD)

29—Two-piece overlapping bolt-end carton. Delivered in blank form, this box is set up by overlapping the ends and inserting the tongue into the U-shaped slots. A strong and substantial container, suitable for heavy and bulky products such as hardware articles. (HD)

30—Full-telescope, four-hooked catch carton. An economical box for articles to be packed in various sizes or quantities. Set up by hand interlocking of tongue locks into corner slots. Highly suitable for local deliveries. (OB)

31—Two-piece telescope carton with overlapping ends. Assembled and folded by hand. Overlapping ends, when folded in, lock securely against the sides. One model has an extra tab which provides additional corner protection. (US)



29



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XUM



32

32—One-piece overlapping side-blank box with single catch-bottom back. Economical form of blank; simplicity of construction permits easy setting up by hand for filling as well as convenient handling in retail outlets. (UP)

Display containers and dispensers

33—Two-piece Climax carton. A practical display unit, easily set up, suitable for holding a number of individual consumer packages. Constructed so that copy may be printed to show internally and externally, though printing is done on only one side of the board. Display panel, which may be die-cut in any shape, is folded back and held erect by supporting flap. Widely used in all retail merchandising fields. For shipping, this box is usually provided with a protective outer cover. (US)

34—One-piece display carton with die-cut folding display panel, Arthur locks, front and back, with overlap for added strength and with tilting device which affords better visibility of contents. (WF)

35—One-piece display container. Top forms a die-cut display panel when folded back. Construction permits cut-away front allowing convenient dispensing of individual units. (CC)

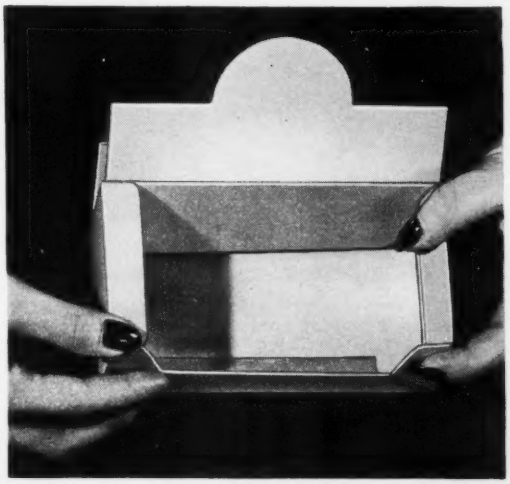
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38



39

36—Panel fold display container with lock bottom and tuck top. Can be made in various sizes and shapes, and with many types of cut-out top and side. Illustration shows also an ingenious special partition which provides space for advertising folders. (WF)

37—Panel fold display container, similar in construction to No. 36, except that the bottom locks are used to form a partition member. (MK)

38—Tilt-back display container similar in construction to No. 36 but die-cut in such a manner as to be set up at an angle which affords better visibility on the counter. This style has separate easel, glued on. (US)

39—One-piece display container. Constructed so that package, when closed, is of convenient cube-shape for shipping and handling. When open, with display flap folded in place, contents (envelopes or packets) assume slanting position which increases their visibility. When made with a broad base, no extra support is required. Protective cover supplied for shipping purposes. (MK)

XUM

40



40—Tilt-back display container, similar in construction to No. 39, but with narrow base requiring an easel which forms automatically as carton is set up by retailer. Requires outer chipboard protective shell. (MK)

41—Counter display dispenser. Display panel is placed at the front. Cellophane window permits unbroken display of contents despite the removal of units that are sold. Lock bottom makes this container suitable for heavier units. (US)

41



42—Hanging dispenser for wall use. Sample shown uses familiar reverse-tuck carton construction but may be any of several types. Usual shape is long and narrow in which units drop down by gravity to replace those which are sold. (UP)

42



XUM



43

43—Display container or counter dispenser, designed especially for products packed in flexible bags which sometimes contain excess air. Method of handling compresses the packets so that goods present normal appearance when container is set up in retail store. Requires outer protecting sleeve for shipment. (OB)



44

44—Counter merchandiser. This single sample is representative of a type of display piece available in an infinite variety of shapes, sizes and constructions. Special features of design and function permit exhibition of any type of merchandise as single units or as related articles. This type of folding box is created primarily for advertising and promotional purposes. (OB)



45

45—Display basket. Designed particularly for "jumble" display of articles adapted to self-service merchandising. Primarily used for advertising purposes. Construction shown can be knocked down and shipped flat in the shipping cases with the merchandise. (OB)

CREDIT—Code letters in the text refer to the folding carton manufacturers to whom credit is due for help in supplying representative samples. They are:

CC	Container Corp. of America, Chicago, Ill.
WF	William W. Fitzhugh, Inc., New York.
HD	Hummel & Downing Co., Milwaukee, Wis.
MK	Milprint, Inc., Milwaukee, Wis.
OB	Ohio Boxboard Co., Rittman, Ohio.
PP	Paper Package Co., Indianapolis, Ind.
RL	Rossotti Lithographing Co., North Bergen, N. J.
SP	Simplex Paper Box Corp., Lancaster, Pa.
ST	Stecher-Traung Lithograph Corp., Rochester, N. Y.
UP	United Paperboard Co., New York
US	United States Printing & Lithograph Co., Cincinnati, Ohio.
WP	Waldorf Paper Products Co., St. Paul, Minn.

Waxed and paraffined cartons

Recent developments in the packaging of meats, frozen foods and other products which require a water-vaporproof container have made increasing demands upon cartons made of wax-coated or wax-saturated paperboard. Certain products, such as ice cream, butter, lard, oleomargarine and frozen foods are almost always shipped and stored under full or partial refrigeration. On removal from refrigerated temperaperatures to room temperatures, moisture droplets gather on the surface of the carton. Wax treatment provides resistance to this moisture and enables the carton to retain its strength and shape en route to the consumer's kitchen. Paraffined cartons also provide substantial water vaporproofness and gasproofness, thus retaining freshness in the packaged product while resisting permeation by odors which might come from outside the carton.

Paraffined cartons for foods, in contrast to unparaffined cartons for miscellaneous uses, are well standardized in construction and in size. This is especially true of packages for ice cream, units of which have been standardized in pints, quarts and multiples thereof. Packaging of ice cream is either a semiautomatic or a manual operation, and this has a bearing on standardization of construction.

Likewise, cartons for butter, lard, oleo, shortening and cheese have a constant unit of sale—the pound or multiples of it—which limits the extent of their variation in size.

Laminated cartons

During the past few years, a new kind of package which combines the properties of a carton and a wrap has been used for sliced bacon and other cured-meat products, packed by hand and pressure-sealed. More recently, the adoption of a similar package for butter and margarine marked the first significant packaging departure in this big-volume field in many years.[1]

The package (Fig. 1) comprises a specially scored reinforcing strip of 70-lb. bleached sulfite sheet laminated to a flexible outer printed sheet made of 40-lb. wet-strength bleached sulfite. Combined, the two sheets form a single flat sheet which folds into a carton type of package. Both components of the lamination are coated over-all with a special paraffin-base wax. In the meat field, the package is essentially the same, but different board weights are used.

Used with an especially developed high-speed machine which wraps and heat seals automatically, the package is said to offer important advantages in economy and convenience, while giving better protection and longer shelf life to these highly perishable products. It is valuable for low water-vapor loss.

Types of paraffin applicatcn

There are two principal methods of applying wax: the high-gloss or cold-water method, which leaves a coating of wax on the surfaces of the carton; and the saturation or impregnation method which drives the wax into the fibres of the board, leaving the surfaces comparatively dry and uncoated. A third and less common manner of treatment is "dull paraffin," by means of which a very light coating of nonglossy wax is laid on the surfaces.

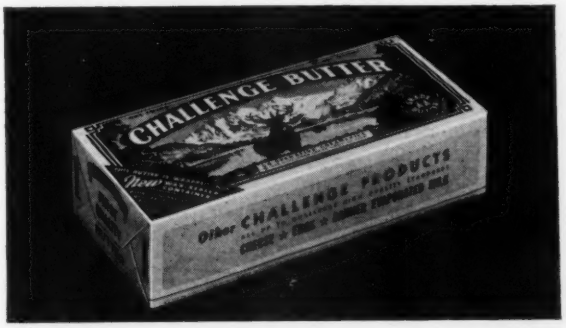
The basis of manufacturing paraffined cartons is the printing and die-cutting of the carton so that its printed design and all the board used in its construction are available in one unit, properly printed, scored and cut. Production of commercial quantities of cartons is handled in combination runs—same number of cartons per sheet. The combination may include cartons of but one design, or it may be made up of various sizes, colors, designs and construction combined to run efficiently together. Manufacturing procedure is: printing, die-cutting and scoring, paraffining and gluing.

Printing and waxing

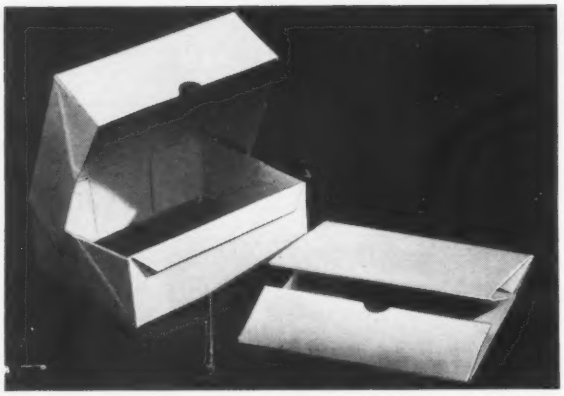
The merchandising advantages of well-printed designs and colors are available to buyers of paraffined cartons. Paperboard manufacturers provide a well-bleached outer surface that is excellent for modern printing processes. A semibleached or unbleached inside surface is usually specified for cartons that carry food not directly in contact with the inner surface—butter and lard, for example. Linerless ice cream cartons are factory-filled, with the ice cream directly

1—Combining properties of carton and wrap, this Mullinix package, here used for butter, is made of a scored reinforcing strip of 70-lb. bleached sulfite laminated to a wet-strength printed outer sheet.

PHOTO, COURTESY WESTERN WAXED PAPER CO.

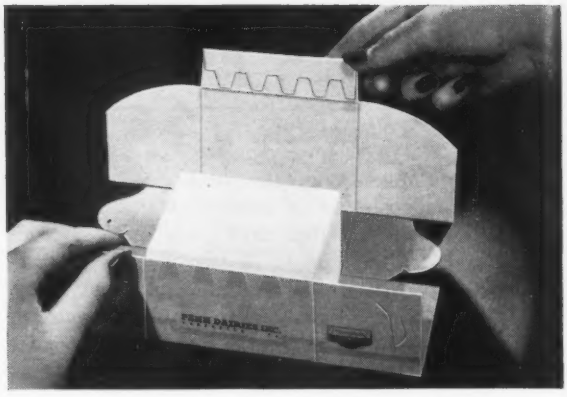


[1] See "Wrap-carton, A New Kind of Package," MODERN PACKAGING, XIX, No. 7 (March, 1946), p. 138.



PHOTOS 2, 3, 5 AND 6, COURTESY MARATHON CORP.

2—Paraffined frozen food carton without liner is automatically opened, filled, closed, overwrapped.



3—Accurate die-cutting makes quick-opening construction for waxed, protective ice cream carton.

in contact with the inner surface. A solid-bleached sulfite board is standard for this carton. Wartime pulp and paper shortages made it necessary to degrade these cartons somewhat, to use grades of paperboard less choice than the standard. However, a return to prewar standards is expected as pulp and paper supplies return to normal.

The inside surface of a linerless ice cream carton is treated with a special, high-gloss, hard-surface wax to ensure against weakness of the surface next to the product. The outside surface is treated with a lighter, egg-shell wax coating which affords adequate protection against attack by moisture from the outside. Varying weights of wax, and varying compositions, may be applied to attain specific protective properties.

Considerable progress has also been made in paraffining. In addition to a store of technical knowledge concerning waxes, wax combinations and properties of waxes, the industry has greatly advanced the technique of applying wax.

Gluing of paraffined cartons

The gluing operation follows the printing, die-cutting and waxing of high-gloss waxed cartons. Special gluing machines remove the wax from the surfaces to be glued, a glue wheel spots the adhesive at the proper points, and the folding and setting of the glued surfaces is then done by the gluing machine. Glues derived from vegetable sources are standard specifications for use in food containers.

For extra charge (an extra machine operation), the paraffined cartons used for ice cream can be furnished with a de-waxed strip on which the names of flavors may be stamped.

4—Outstanding design for waxed carton is this color photo melange lithographed in four colors.

PHOTO, COURTESY D. L. WARD CO.



Frozen food packaging

Because frozen foods require extraordinary protection against dehydration, a number of packages intended to assure that protection have been used. Many have proved unsatisfactory and, according to one of the large commercial producers, the perfect package for frozen foods is yet to be developed. The important role of the waxed carton, however, has been assured in many of the new frozen food packages.

From the point of view of end use, frozen food packages may be divided into four groups: 1) consumer packages of commercial frozen foods; 2) packages used by locker plants; 3) bulk packages for hotels, restaurants and institutions; 4) home freezer packages.

The frozen food package may comprise the carton shell, an inner liner and an outer wrap. When all three are employed, the carton shell may or may not be waxed. When only two of these components are used, as in locker plant and home packaging, a waxed carton is usually required. The expanding field of locker plant packaging especially, offers a widening market for paraffined cartons and containers.

Commercial frozen food packaging methods are constantly becoming more automatic. A paraffined carton which can be opened, filled, closed and overwrapped automatically is now available. In the large commercial plants, the cartons are filled from a hopper at speeds which must be regulated by the nature of the product being packed. Often, it has been necessary to employ several carton-forming machines to meet the speeds of the fillers. On one new line, however, a

single carton-forming machine has a speed which matches that of the filler, having a capacity of 75 cartons per minute.[2] In addition, carton closing, frequently a hand operation, is now being performed automatically.

Locker plant packaging, bulk packaging and home freezer packaging of fruits, vegetables and precooked foods is either a hand or a semiautomatic operation.

Regardless of size of package or scale of operations—bulk packages, commercial consumer units, or home-freeze—all branches of this activity have one major problem in common: that of protection against the loss of moisture which is very likely to cause freezer burn and desiccation.

The sub-zero and near-zero atmospheres in which foods are frozen and stored are extremely dry. Seeking to absorb moisture from every source, the dry air "blots up" moisture and exerts a constant "pull" on any object having moisture content. The air takes up moisture in the form of water-vapor, an invisible gas which has a tendency to penetrate readily ordinary papers and packages.

A striking demonstration of this air attack can be arranged by placing an uncovered cake of ice in a locker storage room. Little by little the ice will disappear. It will not "melt"; it will not leave the pool of water you would expect to see when ice melts in high temperatures. The cake of ice will grow smaller and smaller and eventually it will disappear without a trace. Its water vapor will then have been entirely absorbed by the dry air.

This is the exact physical action against which frozen foods must be protected. This is the damaging condition which makes it absolutely necessary that frozen foods in storage be covered by packaging materials which insulate them against this action. Because their moisture is air-absorbed in the form of water vapor, foods change in appearance, in taste and in nutritive value. This change may run from a few white, dry surface spots, commonly called "freezer burns," to almost complete desiccation. Their taste will then vary from an occasional tough or fibrous spot to a straw-like, completely flavorless lump.

For the most satisfactory freezing, the complete content of the package should be frozen as thoroughly as possible. Because of an odd shape, certain packages do not permit penetration of the freezing temperature to the entire content. Thus a center section of certain packages may be only partially frozen. Experience proves that a package which allows more inch area exposed to the cold temperatures freezes faster and holds the freeze better than a package with less exposed area.

Not all packaging materials can withstand the damaging attack of the cold and extremely low humidity. Certain wrapping materials may develop a tendency to dry out, to become brittle and to break when exposed to these conditions. Certain coatings applied to papers as a layer for moistureproofness or for heat-sealing purposes may crystallize and break after exposure to storage temperatures and humidity. This breaks the continuous water-vapor protection afforded the contents of the package and every break provides an opening for a loss of moisture.

A point which hasn't been stressed much in previous discussions of frozen food packaging is the range of temperatures which certain products must have. Some vegetables, for example, are precooked or blanched before freezing. From a temperature above boiling point, they are placed in a package at room temperature. Then they are exposed to a sub-zero temperature for quick freezing and finally they are stored for an indefinite period at a locker freezer or home freezer temperature. Such extremes of heat and cold, such wide variation in temperature and humidity make certain foods even more sensitive to damage and make more emphatic the need for absolute packaging protection.

The ideal package, for any one of these divisions of frozen foods packaging, will combine all the desired protective features, sturdy construction and the more practical advantages of easy setup, filling and closure, but the first and most important packaging rule is: "Protect against water-vapor loss!"

[2] See "Color for Birds Eye," MODERN PACKAGING, XIX, No. 1, (September, 1945) p. 98.

5—Ice cream packages are paraffin "saturated" for protection to contents, then are factory filled.



6—Pint, quart, and quart-refrigerator styles are produced in linerless, waxed ice cream cartons.



XUM

Collapsible set-up boxes

by Roger C. Dickey

For all practical purposes, the collapsible set-up box is the equivalent of a rigid set-up box. It is made from regular folding boxboard, cut with glue flaps at the corners, and has diagonal creases in certain side walls which permit the walls to be folded in toward the center of the body of the box. The collapsible set-up box does not attempt to compete with the fancy rigid set-up boxes, but it does offer certain advantages over the cheaper, or commonly used set-up box.

Economy of shipping space—Ten or more collapsible boxes can be shipped in the place of one set-up box.

Economy of plant space—Many plants do not have the space to store set-up boxes, but a quantity of collapsible boxes may be stored and set up as needed.

Economy of manufacture—Collapsible boxes cost less to make than rigid set-up boxes. Regular folding boxboard which may be attractively printed is used, and the box is fabricated on high-speed rotary machines. The staying and wrapping operations are eliminated.

Facility of filling—When certain types of corner construction are used, the side walls of collapsible boxes remain upright, so that both hands may be used to fill the container.

Several machines are used for making the collapsible box. One of the most common is the Brightwood type. A plunger motion forms the box which is then mechanically collapsed. This method does not provide the stand-up feature and is very slow in operation. High-speed rotary machines eliminate the plunger principle and depend upon mechanisms for folding the diagonal panels, the glue flaps and the side walls while the blank is traveling at high speed. Such machines have a wide range and can handle a number of different box styles.

One of the most common types of collapsible box is illustrated in Fig. 1. It is known as the tray box, and is used extensively for packaging rolls, buns, cookies and other food products. The product and tray are completely overwrapped with transparent material.

In construction there are two diagonals in the two opposite side walls. All walls are folded inwardly toward the center of the box. The ends may be square, as shown, or may be round or oval. The construction of the glue flap may be as illustrated so that when the side walls are set up, the bottom portion of the glue flap drags on the body of the box producing a friction lock.

A box of the construction shown in Fig. 1 may be used in conjunction with a cover, made slightly larger, to form a telescope box, extensively used for packaging articles of clothing and other products which may remain on store shelves for a period of time. It is sometimes advantageous to make the body portion of two-piece telescope boxes outwardly collapsible and the cover inwardly collapsible. Thus, the side walls of the body have a tendency to flare outward and the side walls of the cover spring inward producing a rigid box with side walls snugly fitted and well supported.

The one-piece collapsible box with cover (Fig. 2) is a popular type having almost unlimited application. It is extensively used for packaging bakery products and may be used as a display container for 12 or 24 individual boxes. In this case, the upper portion of the cover is folded down. It will be noted that two diagonals are found on each of the two opposite side walls.

A variation of this construction is shown in Fig. 3 where two diagonals are placed in the front panel and one diagonal in each of the side walls. The panels all fold inwardly toward the center of the body portion of the box. The body may be shallower than that of the box shown in Fig. 2, and the height of the side wall may be almost the same dimension as the depth. The glue flap may be constructed to hold the side walls upright. Such boxes are extensively used for packaging doughnuts, tomatoes, limes, and other products.

The six-corner glued box (Fig. 4) is exactly what the name implies; a container glued at six corners—at the four body corners and the two cover corners. It serves the same purpose as the telescope box yet requires less stock. It offers the dustproof feature, the locking feature of the side walls. If the cover panels are made the same height as the body side walls, greater resistance to crushing loads is offered. It can be utilized for packaging products such as hardware, articles of clothing, sporting goods, bakery and the like.

Above we have briefly outlined a few of the more common types of collapsible boxes. There are many other styles, such as boxes collapsed through the bottom, the spot glued box, etc.

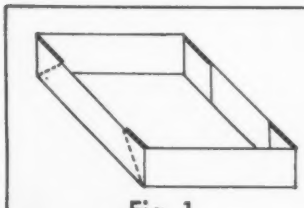


Fig. 1

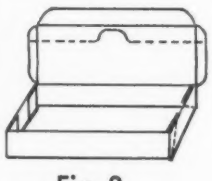


Fig. 2

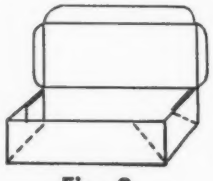


Fig. 3

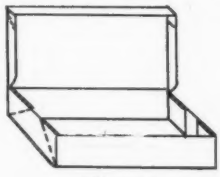


Fig. 4

Bag-in-box packages

by Alan D. Crowley

Until a better example of bag-in-box packaging comes along, the U. S. Army Field Ration-K Unit can serve well as a representative illustration of this important packaging technique. Here a portion of the breakfast unit is packaged in four cartons and three bags, all rich in protective characteristics. This is an extreme case designed to meet extreme conditions. Nevertheless, it provides a good example of material combination possibilities.

Probably no other package development received more of a boost from the pressure of war than the bag-in-box package, for principal sources of tin were lost and other packaging materials were limited or scarce because of increasing demand. During those days, many turned to the bag-in-box as one of the most promising packages to help bear the increasing load of war and essential civilian packaging. Perhaps the most significant feature of this package was the possibility it presented of combining the properties of two or more packaging materials for added protection in the finished container. It was virtually wrapping a product in a tailored-to-measure package which would have the *exact* qualities to package a product adequately.

A brief review of the bag-in-box development shows that it gained steadily in acceptance from its early use by the cereal people. Modified versions were found in the packaging of crackers, raisins, shredded coconut and many other products requiring protection from sifting, insect infestation and moisture. More attention was called to this development in 1929 when the frozen food interests favored it as a consumer package.

From that period on, bag-in-box uses became more common, but it remained for the war to bring it into the full stage of its development. That involved an expansion in properties to include protection against water, gas, oil, dust, variable atmospheric conditions, insects and any other condition likely to be encountered between the factory and the foxhole.

Today the bag-in-box has gained such wide usage that its range includes the packaging of extremely dry products, where sifting is a factor, to those products containing moisture or even animal, mineral and vegetable oils. Package sizes vary from that required for a dose or portion of a product to those where as much as 100 lb. or more are packaged. The materials used in the box include all grades of boxboard from plain chipboard to the toughest kraft stocks and with all standard printing surface finishes. The bags are available in all grades from transparent to opaque and have a wide range of protective properties.

The bag

Bag materials include cellophane, glassine, Pliofilm, foil, vegetable parchment, sulfite, bond, kraft and other specialized stocks. • The protective requirement necessary for each product determines material selection, and it is important in all cases to submit the product to both the bag and box suppliers for analysis and material recommendations.

The two bag styles most generally made from these materials are the flat type and the square or gusset construction. Both have middle seams and seal ends, differing only in that the gusset type squares out when in use to permit full expansion within the box.

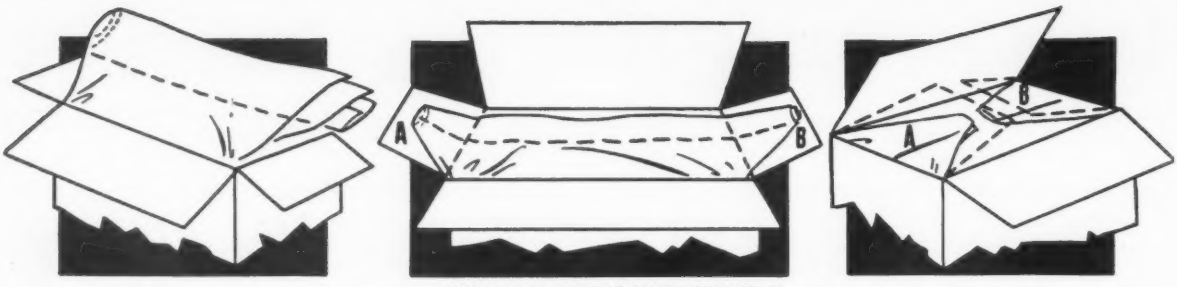
The protective qualities of the bag are enhanced by the use of thermoplastic, wax, lacquer and resin coatings. A heat seal gives products a relatively high degree of protection against elements and conditions which, if exposed to the product or permitted to reach it, would have a harmful or ruinous effect. The laminating agents, amorphous wax and asphalt, used to com-

PHOTO, COURTESY INTERSTATE FOLDING BOX CO.



1—Shipped flat and easily assembled by pressing the sides and locking the bottom, these prelined containers were designed for home freezing. Similar packages are available for commercial use, and may be filled and sealed by means of semiautomatic operations.

XUM



DIAGRAMS 2 AND 3, COURTESY THE GARDNER-RICHARDSON CO.

2—Standard confectioner's fold for closing a bag-in-box package: (Left) After lips of the bag are drawn together, edges are folded over several times until they are level with top of the box. (Center) The bag is now ready for closing. End flaps and "ears" at A and B are folded toward the center of the box. (Right) End flaps and "ears" in final closed position. Remaining flaps are then closed and box sealed to make a tight closure.

bine two or more materials, have properties themselves which contribute to product preservation.

To emphasize the importance of product analysis before selecting the packaging materials, a comparison may be made between frozen fruits and products with an oily content. Bag materials for frozen fruits should have the qualities of moistureproofness, airproofness, greaseproofness, water resistance, heat sealability and low temperature durability, while the emphasized bag characteristics for certain oil products are mainly greaseproofness and effective sealability.

The box

The box performs three important functions:

1. It provides a display surface for brand identification and sales design.
2. It gives a varying degree of protection to the bag, the amount of protection depending upon the required properties of the package.
3. Its form contributes to convenience for retailer and consumer.

While untreated paperboard obviously cannot offer the degree of protection found in the bag, it can offer a relatively high degree of resistance to moisture, water and grease. The surface may be printed upon, and the printing qualities as well as the folding qualities, the rigidity and the toughness depend upon the requirements necessary to adequately package the product.

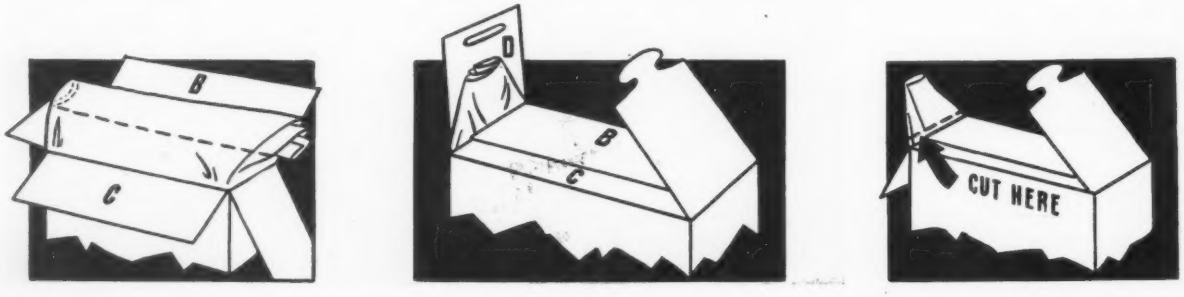
To give an indication of the range of boxboard toughness, a 0.035 plain chipboard might have a bursting strength of about 80 lb. while a 0.035 solid kraft sheet might require 275 lb. of pressure to cause a break in the boxboard. The most widely used box materials are machine coated, clay coated, white surface board, solid kraft, bleached manila, asphalt-lined board for moisture resistance, and many chemically treated boards to provide special protective features.

There are hundreds of box styles, many of them "tailored" to fit the particular requirements of the product. Tuck and seal end cartons are by far the most popular style. However, a close study of the product is always desirable to arrive at boxboard recommendations and to obtain suggestions as to possible merchandising features in the form of display cartons, windows for product display, dispensing arrangements and special re-closure and re-use possibilities.

Construction

There are three types of bag-in-box construction. The first is the "floating" type, where the bag is inserted loose in the box by means of a mandrel. The

3—Pouring spout closure: (Left) When sifting must be prevented or if vaporproofness is required, bags should be heat sealed; if not, confectioner's fold may be used. Only one "ear" should be turned in before flaps B and C. (Center) Extending flap is folded toward center along with slotted flap, D. Tongued flap is folded over and locked. (Right) In opening, end flap is turned back and extending "ear" is cut off to make a pouring spout.



setting up and assembling of this construction generally are done at the scene of the packaging operation.

The second construction comprises a bag which is spot-glued into the box during manufacture and shipped to the packager folded as a complete unit.

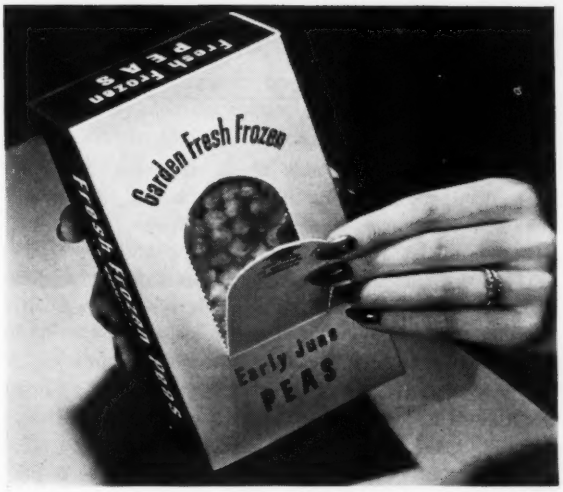
The third method finds the bag firmly glued to the inner walls of the carton with enough overlap at both ends to form a seal—a complete bag-in-box.

If the full value of the bag-in-box package is to be obtained, the closure is of the greatest importance. In cases where the nature of the product makes sifting a likelihood, or where liquid-tightness or high water-vaporproofness is necessary, heat sealing is preferable.

When the inner bag is sealed, the top should be folded back two or three times in the manner commonly called "confectioner's fold." Then the "ears" are turned in, and the result is a very tight closure, especially if the filled bag fits so snugly into the box that pressure is exerted on the bag by the top folds of the box. To provide a pouring spout for the contents, one of the "ears" is left extended in such a manner that it is closed when the end flap of the box is locked or glued shut. When the box is opened, this protruding "ear" is cut to form a convenient opening. The accompanying diagrams show the steps in these two operations.

The future possibilities of the bag-in-box construction seem to be about as broad as the imagination of the user. Several examples are included in our illustrations: a carton with a perforated window which when torn out exposes the product to the consumer behind a transparent film (Fig. 4), and a bag-in-box combination employed in the packaging of frozen orange juice (Fig. 5).

One promising frozen food carton, adaptable to machine filling and sealing, has a bag which is glued into the carton. Another, promising for many products,



PHOTO, COURTESY SYLVANIA INDUSTRIAL CORP.

4—The housewife can see what she is getting in a frozen food package which has a scored side section.

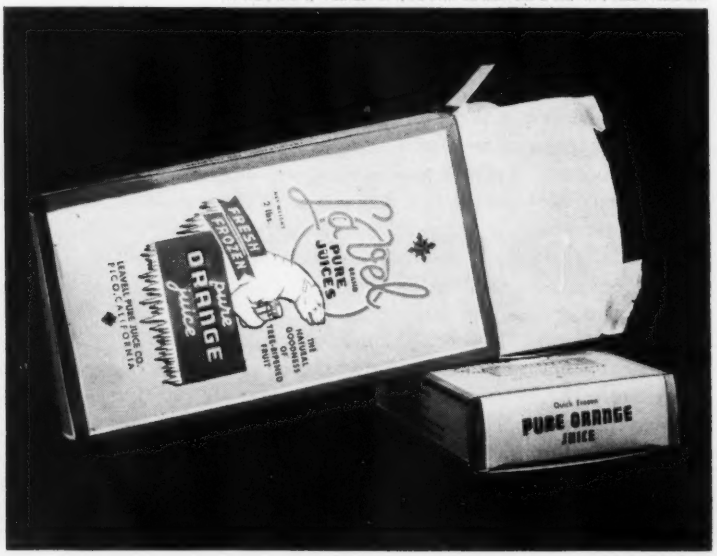
holds portions of several foods in a single package, each food having its own bag.

The bag-in-box package is characterized by general utility and adaptability, both from the consumer's point of view and the viewpoint of the user. It assures complete siftproofness, airproofness and leakproofness as well as flexibility through the proper selection of liner material and boxboard treatment. "Tailored" to fit a given product, it presents an economical, salable consumer package, adapted to both small and large packaging operations yet retaining all of the folding carton advantages of economy in shipping, storing and handling. Visibility, protection and a fine design are all advantages present in bag-in-box packaging.

5—Now, with the aid of the bag-in-box, fresh frozen orange juice may be carried to the consumer. The printed cellophane bag at the left holds the juice. 6—The outer carton and closed package are shown at the right.

PHOTOS 5 AND 6, COURTESY E. I. DU PONT DE NEMOURS & CO., INC., CELLOPHANE DIV.





XUM

Set-up paper boxes

by E. T. Tedeschi

A set-up paper box is a rigid, noncollapsible container produced in three-dimensional form and delivered to the consumer ready for use. It is manufactured chiefly from paper and paperboard. Basically, it consists of one or more blanks of nonbending paperboard, usually, but not necessarily, wrapped with paper. While most set-up boxes in use today are either oblong or cylindrical in shape, the architectural variations are as limitless as the designers' ingenuity and the manufacturers' productive ability will permit. In its simplest form, it is a square-cornered, two-piece container, properly reinforced. However, a set-up box may comprise several members, each covered with its own distinctive wrapper, lined with rayon or velvet. Such boxes furnish a rich setting for the most expensive silverware, cosmetics or jewelry. In addition to the conventional shapes, the set-up box may be produced in a wide range of interesting and novel shapes (see p. 161 and p. 168 ff.).

One of the factors which has made the set-up box so popular as a packaging medium for an endless variety of products is its economy. It will be found on the retail counters in the stores where mass-produced, low-priced trinkets are sold, as well as in luxury shops where quality and distinction are paramount. Low-cost paperboard and economically produced wrapping material are its chief raw materials, while the automatic wrapping machinery used for its manufacture completes the story of low unit cost. Set-up box factories are located in all industrial centers of the United States, making it possible for the user to buy locally, thereby minimizing transportation costs.

While economy of manufacture may contribute most to the wide distribution of the set-up box, its convenience to the user must be given only slightly less consideration. Set-up boxes arrive in the user's plant ready for immediate use—he need do no more than lift the lids. There are no preliminary and costly setting-up operations, nor is there any need to add expensive protective measures to ensure safe carriage for the article so boxed. Articles packed in set-up boxes are ready either for shipment to consumer or to the warehouse for storage.

One of the primary reasons for packaging at all is protection; protection from breakage, protection from dirt and dust, protection from rough handling, protection from pilfering; in short, the necessity for assuring the ultimate consumer that the article being purchased is in exactly the same condition as it was when it left the manufacturer. The rigidity of the set-up box can ensure this feature through proper design and the use of proper materials. Boxboards are manufactured in thicknesses of 0.025–0.065 in., and should greater rigidity be necessary, boxboard can be laminated to meet almost any specification. During the war, the set-up box engineer was called upon to design packages for highly sensitive bullets, shells, explosives and detonators which were ultimately shipped all over the world under all sorts of conditions. Through the skillful use of partitions, dividers and die-cut wells and recesses, the designer found the answer in the set-up box. This same skill is commonplace in peacetime, for the set-up box can be found as the proper medium for packing delicate vials of perfumes, drugs and even fragile Christmas tree ornaments.

No other type of container combines economy, convenience and protection with versatility as does the set-up box. In addition to the variety of interesting forms which three-dimensional construction permits, an endless number of covering and lining materials are available to the manufacturer.

Most important of these materials are the special coated papers. These are produced economically in roll form from which the wraps are cut. The paper manufacturers have long realized the possibilities in the use of set-up boxes and have responded by developing and producing papers in a limitless variety of colors, embossings, decorative effects and protective and decorative finishes.

Available papers for box covering closely resemble leather, wood, metal, fabrics and enamel finishes, allowing the designer free play for his creative ability. These papers offer splendid possibilities for diversification of color and decoration without the necessity of purchasing extremely large quantities to absorb the initial cost of art work, engravings, etc.

When an individual decoration is required, box wraps may be printed, embossed, die-stamped, engraved, lithographed, photo-offset, printed by rotogravure, lacquered—in fact, any decoration that can be applied to paper may be used on the wrap for set-up boxes. In addition, set-up boxes can be wrapped with leather, bookcloth, velvet, rayon and almost any other kind of thin flexible sheeting, to give it added distinction and permanence.

Individual design can be achieved at comparatively small cost. There are no expensive tools or jigs to buy and change-overs in style and size can be made in short time. Thus, a prospective buyer of set-up boxes need not fear that his package must resemble that of his competitor, nor is it necessary for him to adopt the same package for continuous use. Frequent changes in package design can be made economically to give selling impetus to his product.

The modern user of containers for articles sold at retail expects more than a simple protector which will ensure delivery of his product in safe condition. In addition, his package must have eye appeal which will

translate itself into sales appeal. It must have the appearance of permanence and beauty which will assure it a prominent place in showcases, in window displays and on the counters at the points of sale. The sales appeal of many a commonplace appearing, but nonetheless essential, article for everyday use will be greatly enhanced by displaying it in a custom-built set-up box designed to attract the consumer, first to the package, and through the package to the article itself. Such packaging will bring sure dividends in greater public acceptance and increased sales. Eye appeal can be accomplished through the use of striking color effect, styling and printed descriptive matter on the package.

When the article to be packaged needs no fancy attire to call attention to itself, but rather needs but to be put before the public eye to invite the buyer's favorable response, proper packaging can result from the use of transparent film in conjunction with the set-up box. Lightweight transparent film permits the combination of all the essential features of set-up boxes with individual "show-case" results. It is used for windows in display boxes for articles such as thermometers, face powder, nipples, candy, etc. Rigid transparent sheets can be formed into fitting members of set-up packages and are often used with paperboard parts in order to attain the display effect which is most desirable.

In the nature of his business, the set-up box manufacturer operates in a limited area because of the fact that this product is not delivered in collapsed form. Shipments over long distances, with few exceptions, are quite rare. The result is that the units of manufacture are not as a rule mammoth mass production plants. Hence the user of set-up boxes is quite likely to be able to find a number of sources of supply. Another result is that each one of these manufacturer's units may find itself serving a particular industry or a relatively small group of industries without realizing how broad a scope the set-up box manufacturers, as a whole, cover. Hence when the industry made a postwar study, the results were a gratifying revelation of service and potential future service for a great many lines of business—confectionery, boots and shoes, cosmetics, electrical supplies, hardware, jewelry, textiles, toys and games—to mention only a few.

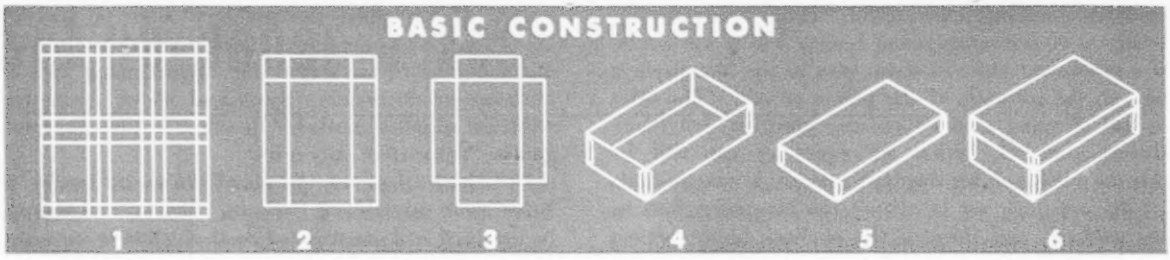
Not the least of the virtues of the set-up box is its value as an advertising medium. It can, and should, be designed and constructed so that while it is on the dealer's shelf, it reflects the quality of its contents and convinces the buyer of their merits. Upon its arrival at its point of use, it will remain a subtle reminder of its contents to all who see or use it. There is ample space on a set-up box upon which to include some printed message without destroying its beauty of design or color, and at little or no additional expense. For the manufacturer who can afford a container of lasting value, it is possible to construct a set-up box from sufficiently durable materials to allow a lifetime of use thereby keeping the product name before the consuming public for long periods of time. When, as in the case of face powder or ready-made bandage boxes, the package is called upon to keep its original beauty and to perform its original functions for the life of the product it contains, a custom-built set-up box offers the best solution. Each time it is used it gets across its story to the consumer, thus providing distinctive product identification where it will do the most good.

For the manufacturer whose need is a safe carrier for fragile items, a retail dispenser for a number of the same items, a semipermanent cabinet for medical supplies or small machine parts, a simple mailer or a shipper for highly sensitive explosives, the answer can be supplied in the set-up box field. Diagrams of the basic construction of such boxes and a glossary of set-up box terms will be found on the following pages. These are followed by a full pictorial review of successful set-up boxes of the principal types as well as an article discussing special set-up box types.

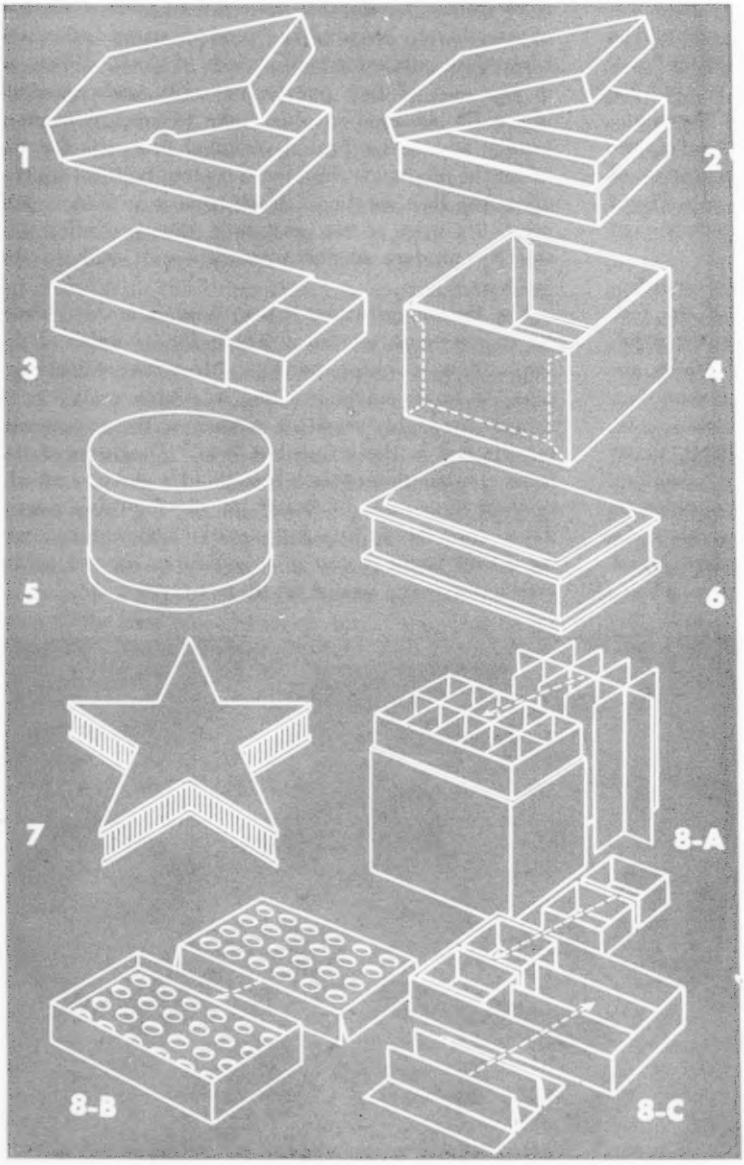


"Ready-to-use" set-up paper boxes prove their value in many ways. They serve as containers for such items as precision instruments, machine parts and small tools. Often they have re-use value, an important merchandising point. With waxed paper inner liners, they adequately protect ball bearings and similar articles.

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Six steps in basic set-up box construction: (1) Boxboard sheet is scored to size; (2) scored sheet is broken into individual blanks; (3) blanks are corner-cut; (4) blanks are turned down, corner-stayed; (5) lid is similarly processed; (6) lid and box complete, form the simplest set-up box type, known as "skeleton" or "rough carton."



Many variations and combinations may be developed from the basic set-up box, and many types of paper covering and decoration may be applied to them. Some examples of these are given in this diagram. Others obtainable by handwork may be found in the 1938 and 1939 editions of the PACKAGING CATALOG.

1—Full telescope box.

2—Neck or shoulder style.

3—Slide style.

4—Ended box.

5—Round box.

6—Extension edge with pad top.

7—Star shape.

8—Examples of interior partitioning used for additional protection of box contents.

8-A—Slotted partition.

8-B—Died-out platform.

8-C—Longitudinal and tray dividers.

Glossary of set-up box terms

Name of Material Machine or Construction	*Definition*	*Name of Process or Operation*
ADHESIVE	Any viscous substance used to attach one material to another. Commonly used in the manufacture of paper boxes are animal glue, vegetable glue (hot or cold), gums, dextrins, paste	
BALING PRESS	Machine for baling scrap	Baling
BAND	Strip of covering paper around sides and ends of box, without turn-in	Banding
BASE	Lower unit or receptacle of a paper box	
BENDING MACHINE	Machine used for bending sides of base, lid or tray	Bending
BLANK	Any die-cut, scored and corner-cut, or otherwise partially prepared section of boxboard, in the flat, to be formed into a box or part thereof	
BOTTOM	Under surface of the base	Bottom setting
BOTTOM LABEL BOTTOM PAPER	Paper attached to bottom or under surface of base	Bottom papering
BOX	Complete paper box, including base and lid; also used for *base* alone	
BOXBOARD	Board used for paper boxes*	
COMPARTMENTS	Subdivisions in a box formed by partitions	
	Placing lids on bases	Closing or lidding
CONTAINER	Large paper box used to hold definite number of smaller boxes	
CORNER	Line formed by junction of sides and ends of base, lid, tray	
CORNER-CUTTING MACHINE	*For Board*—Machine for removing corners from scored blanks and for cutting triangular piece from "ended" box blank, so that side and bottom flanges will bend without interference. Available in single, double, quadruple models *For Paper*—Machine for cutting corners from paper blanks used in loose and tight-wrapping operations	Corner-cutting, Mitering
COVER	Upper or closing unit of a paper box	
COVERING MACHINE	Machine used in covering, trimming, or bending boxes or parts thereof with *paper from roll*. Available in hand-operated and automatic models	Covering
CUTTER	Machine for cutting boxboard, paper and other materials into sheets or strips of smaller dimensions	Cutting
CUTTING AND CREASING PRESS	Machine for cutting and creasing and die-cutting or scoring blanks in boxboard	Cutting and creasing Die-cutting
CUTTING RULE	Steel strips, ground to center or side face used for cutting through stock	
CUT-SCORING RULE	Steel strips, ground to center or side face, used for partially cutting through stock, i.e., scoring form for purpose of forming a bending line	
CREASING RULE	Steel strips with oval face, used to form a crease or bend a line in stock	
DIE-STAMPING PRESS	Machine used in reproducing design or lettering from engraved plates	Die stamping

* For descriptions of grades, see "Boxboard—Types and Selection," p. 132.

Name of Material Machine or Construction	*Definition*	*Name of Process or Operation*
DIVIDERS	Loose strips of paper or boxboard used to separate commodities placed side by side	
DOMING MACHINE	Upright press for embossing or doming by applying heat and pressure	
DROP-END	A box in which the end of the base is made in two parts, one hinged to the other, or in which end is hinged to bottom	
DROP-SIDE	A box with the side arranged as described above	
DRUM	Shell or tube with paper head, for powder box	
DUTCH TOP	Lid with padded top slightly smaller than lid in length and width; set-up with shell	
EASELS	Supports attached to box to hold it upright for display	
EDGE	Line formed by junction of sides and ends to top or bottom of lid, base or tray	Trimming or edging Trimming upper and lower edge of lid, base or tray
ENDING MACHINE	Machine for attaching ends to base or lid. Available in single or double models	Ending or end setting
ENDS	Pieces of boxboard attached to side and bottom flanges of ended box	Ending or end setting
EXTENSION EDGE MACHINE	Machine for attaching piece of boxboard to top of lid or bottom of base, the piece of boxboard being longer and wider than lid or base	Extension edging
FLANGE	Part of a blank glued for attaching ends or sides, or for joining the ends of shell blank. Also walls of any corner box blank	
FLAP LID	Lid without sides or ends, hinged to base	
FLIES	Strips of plain, printed or lace paper attached to inner edge of base to cover goods or for decorative purposes	Flying
FLYING MACHINE	Machine for cutting, gumming and attaching flies	
INVERTED TRAYS	Trays, stayed or unstayed, placed inside base, inverted	
FILLERS	Loose strips of boxboard, plain or scored, used to fill spaces not occupied by commodities	
FRAMES	Die-cut or mitered forms of boxboard so shaped as to form a display frame for the goods	
FRENCH LID	Lid with extension edge which has sides and ends shallower than sides and ends of base, and fits over outside of base	
GLUER	Machine for applying adhesive to surface of paper or boxboard	
HAND SHEARS	Hand-operated knife for cutting sheets of paper, cloth, lace, etc.	
	Any process in the manufacture of a paper box performed without the aid of a machine	Hand work or table work
HINGE	Strip of cloth or paper used to hold parts of box together	Hinging
LABEL	Plain or printed piece of paper attached to box or any part thereof; distinct from top or bottom paper	Labeling

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Name of Material Machine or Construction	*Definition*	*Name of Process or Operation*
LACE	Paper decoration stamped or embossed to imitate lace or embroidery	
LAP	Portion of cover paper that overlaps where ends of paper are joined on base, lid, tray, shell	
LAYERS	Loose pieces of boxboard used to separate horizontal layers of contents	
LID	Upper or covering unit of a paper box	
LID SUPPORT	Tape or ribbon to hold hinged lid in position when box is open	
LIFTS	Pieces of ribbon, cloth, tape or paper attached to trays for convenience in removing from base	
LINING	Material used to finish or decorate interior of base or lid	
LINING MACHINE	Machine for attaching paper from the roll to surface of boxboard	Lining
LOOSE WRAP	Lid covered with paper, wrap-folded and shaped on ends of box, either by machine or by hand; wrappers in one piece with adhesive only at edges	Loose wrapping
MACHINE FORMS	Forms of boxboard, wood, or metal used in conjunction with certain machines, e.g., covering machine forms, wrapping machine forms, quadruple staying machine forms, etc.	
MICROMETER	Instrument for measuring thickness of materials in thousandths of an inch	
NECK	A shell inserted in base, attached by adhesive, and extending above the base into the lid when box is closed (see *Shoulder*)	Necking or shouldering
NEST	Collection of boxes of various sizes, one within another†	
	Bundling and wrapping boxes in kraft paper for delivery	Package wrapping
PACKER	Same as *Container*	
PAD	Card or layer covered with paper or cloth and having one or more layers of wadding or other padding	Padding
PADDED TOP	Extra top, covered with paper or cloth and having one or more layers of wadding or other padding attached to top of lid	Padding
PAPERS	The following is a list of papers commonly used in the manufacture of set-up paper boxes: news, book, label, manila, kraft, friction glazed, flint glazed, brush finish, embossed, printed, floral, fancy	
PARTITIONS (loose)	Slotted pieces of boxboard fitted together to form a series of compartments, and placed in base without being attached to it	Slotting
PARTITIONS (solid)	Any construction of boxboard or other material attached to interior of base to subdivide it	
PATCH	Piece of paper or cloth over lifts, pulls, support for lid, or hardware inside box	
	Process of removing portion of thickness of board from shell or blank flanges	Peeling
PULLS	Metal handles or pieces of tape or ribbon attached to base of shelf or file boxes for convenience in removing from shelves	
REINFORCING	Strip of paper or string under cover paper	
ROTARY BOARD-SLITTING MACHINE	Machine for slitting sheets of board into sheets of lesser width	
ROUND AND OVAL CUTTING MACHINE	Hand-operated machine for cutting round and oval tops and bottoms	
SCORING MACHINE	Machine for scoring and cutting boxboard	Scoring
SHALLOW LID BOX	A box having a lid of less depth than the base	
SHELL	A glued blank, any shape but round tube, open at both ends	
SHELLS (loose)	Shells used to support layers	
SHOULDER BOX	Box with a glued neck so inserted that ends and sides of base form a shoulder upon which lid rests	
SHOULDER BOX GLUING MACHINE	Machine used to glue in necks	
SLIDE BOX	Box with lid in shell form, into which base is inserted	
SLITTING MACHINE	Machine for slitting rolls of paper into rolls of lesser width	Cutting or slitting
SLOTTING MACHINE	Machine for cutting slots in boxboard for forming partitions	Slotting
SLOTTING SAW	Saw for cutting slots in boxboard for forming partitions	Slotting
STAY	Material used for reinforcing corners of base, lid, or tray; may be of paper, cloth, combination (cloth and paper), wire or metal	
STAYING MACHINE	Machine for reinforcing corners of paper boxes or parts thereof. Available in single and quadruple models	Staying
STENCIL MACHINE	Machine for applying adhesive to edges of paper to be used on wrapping machine	Stenciling
STEPS	Shells or trays of varying sizes attached inside base to raise one row or portion of contents higher than the row next in front; or attached inside lid to hold articles of various heights in place	
STOPS	Pieces of boxboard attached inside of ends of lid to hold base in proper position when height of base is less than height of lid	
TAPE	Woven or braided cotton material	Taping
TELESCOPE BOX	A box with base and lid of the same depth	
THUMB-HOLE	A semicircular or triangular cut made in sides or ends to facilitate removal of lid from base, or contents from base	Thumb-holing
THUMB-HOLING MACHINE	Machine for cutting thumb-holes	Thumb-holing
TIGHT WRAP	Lid, base or tray covered with paper, wrappers being in one piece and having entire surface covered with adhesive	Tight wrapping
TOP	Outer surface of the lid	
TOPPING MACHINE	Machine for attaching top or bottom paper	Topping
TOP-PAPER	Paper attached to top of lid	
TRAY	A receptacle with no lid	

† According to present ruling for Freight Classification:
Unless otherwise provided, . . . nesting means that three or more different sizes of the article for which the "nested" specification is provided must be enclosed each smaller within each next larger, or that three or more of the articles for which the "nested" specification is provided must be placed one within the other so that each upper article will not project above the next lower article more than one-third (1/3) of its height.

Pictorial review of set-up boxes

The part played by the set-up box can best be evaluated by a study of its forms and uses as depicted in the pages that follow.

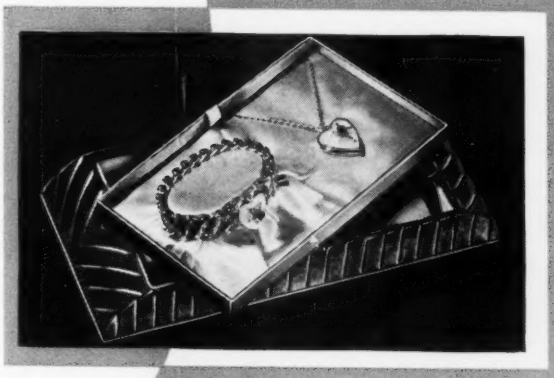
This type of package is at its beautiful best when used for confectionery, cosmetics, lingerie and other luxury products; and with the lifting of restrictions and the alleviation of shortages there has come a return of decorative packaging practices that were badly missed.

But the utility role will not be abandoned. The set-up box is a "double duty" package.



1

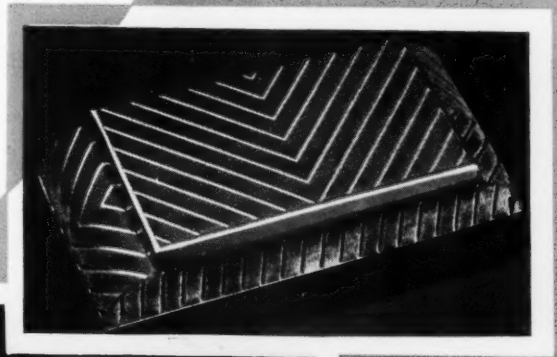
Decorative uses



2

1—Large, half-round box with hinged lid and ribbon stop. Sturdy construction affords excellent protection for the contents, which make up a cosmetic set. Box has shoulder construction with an interior platform covered in colored rayon satin to set off contents. Photo, W. C. Ritchie & Co.

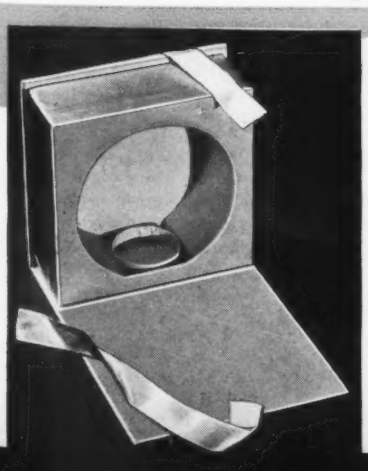
2 and 3—Two views of the same box, which is a jewelry container covered in fabric. In Fig. 2, the box is open to display contents as mounted on satin covered interior pads. Fig. 3 shows the same box closed to reveal the strong construction as well as the handsome appearance of this gift container. Photo, Mason Box Co.



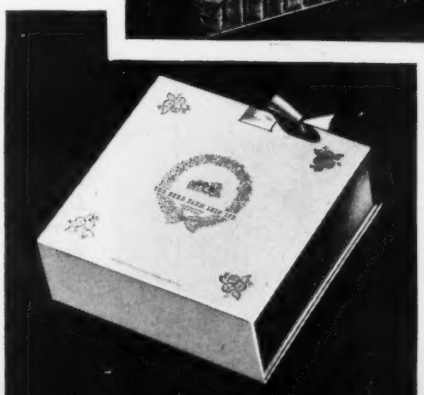
3

4 and 5—Hinged-lid box with projecting top and bottom, ribbon tie; inverted die-cut platform tray for support of contents. Photo, Warner Bros. Co.

5



4



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7



6



8

6—Shoulder box with hinged lid and domed and padded top which is inset into recessed tray. It is fitted with satin-covered supporting platform. Lid is padded on the inside. Color and design show dignity and restraint, but trade-mark affords quick identity. Photo, Old Dominion Box Co.



9

7—Round powder drums with flush edges, domed top covers and projecting edge bases. Photo, F. N. Burt Co., Inc.

8—Cylindrical powder container with metal ends and plastic sifter top which snaps on over a felt disk. Photo, W. C. Ritchie & Co.

9—Decorative confectionery box, heart-shaped for seasonal appeal. It is covered with fabric and has extension edges on base and top. Photo, F. J. Schleicher Paper Co.

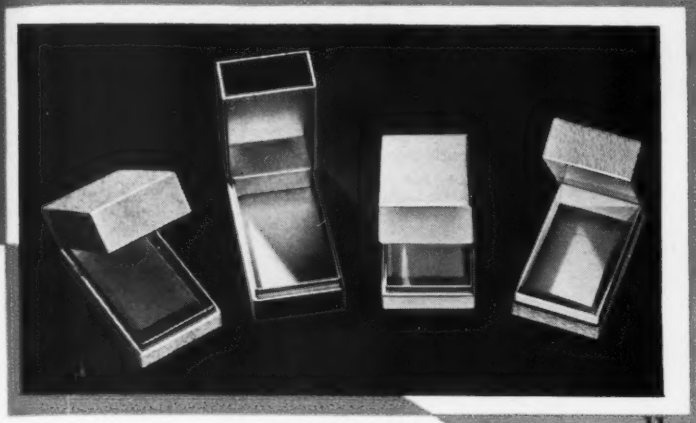


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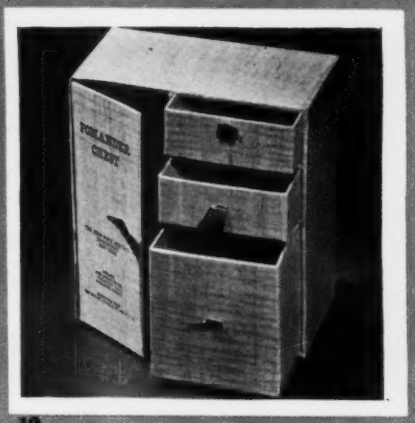
10—Gift box for confectionery is octagonal in shape, has extension edges on top and base. The decorative ribbon bow is appliqued. Photo, F. J. Schleicher Paper Co.

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11



12

11—Group of small, hinged-lid cosmetic bottle boxes, covered and lined with fancy paper. Edgings of various colors increase decorative effect. Photo, F. N. Burt Co., Inc.



13

12—Novelty container for cosmetics; box is tight-wrapped in fancy paper, has three separate removable trays to simulate drawers of chest. Photo, Warner Bros. Co.

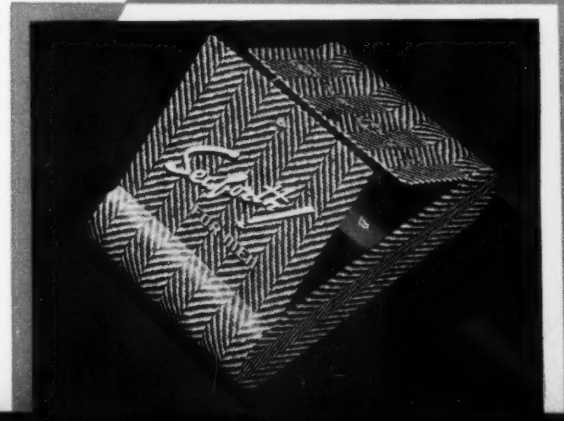
14



13—Box for handmade perfume bottle has projecting base and upright back panel; various parts are covered in satin. Photo, Dennison Manufacturing Co.

14—Box for novelty perfume bottle has solid projecting-edge base and receding secondary die-cut base; top is truncated pyramid with labels applied separately on all four panels. Shown in the background is a die-cut supporting member of plain chipboard. Photo, Dennison Manufacturing Co.

15



15—Container for men's toiletries: oval case with lid flaps and snap fastener. Interior divider protects contents and facilitates packing. Photo, Warner Bros. Co.

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Industrial uses



16

16—Telescope box for brake linings; end panel provides space for identification, size specifications, etc. Photo, Simplex Paper Box Corp.



17

17—Hinged lid box with interior partitioning to protect small vials and provide for easy removal. Die-cut block holds necks of vials firmly in position. Photo, Dennison Manufacturing Co.

18—Hinged lid shoulder type of box for vitamin pack. It has an interior paper lining, cellulose tray and protective flap. Photo, W. C. Ritchie & Co.



18

19—Shallow lid box for toiletries has separate interior box to hold shaving-soap container. The top of the latter has a die-cut lid to permit display of contents. Photo, Simplex Paper Box Corp.

19

20—Shallow telescope box designed for protection and easy packing of surgical instruments; fitted with flannel-covered platform which holds instrument firmly in place. Photo, Walter P. Miller Co., Inc.

20





21—(Left) This cosmetic box with hinged lid and mailing fastener was adapted for military use as a camouflage kit. (Right) Telescope box, thumb-cut for easy opening, is used for military parts. It was designed in accordance with Joint Army-Navy Specifications. Photo, Mason Box Co.



21

22—(Upper) Slide type of box for protection of delicate tipped tool. (Lower) Telescope box with die-cut partitions braced by interior divisions and protected by cotton pad in lid. Designed for protection and easy selection of small drills. Photo, Cambridge Paper Box Co.

22



23—The familiar druggists' prescription box for pills, pellets and capsules is a round, banded set-up box. Photo, F. N. Burt Co., Inc.

23



24—Partitioned boxes of paperboard treated to resist grease for packing small tools. Note gummed flaps for sealing the package. Photo, W. C. Ritchie & Co.

25—A sturdy set-up box of telescope construction takes the place of the familiar metal container. Photo, Dennison Manufacturing Co.

24



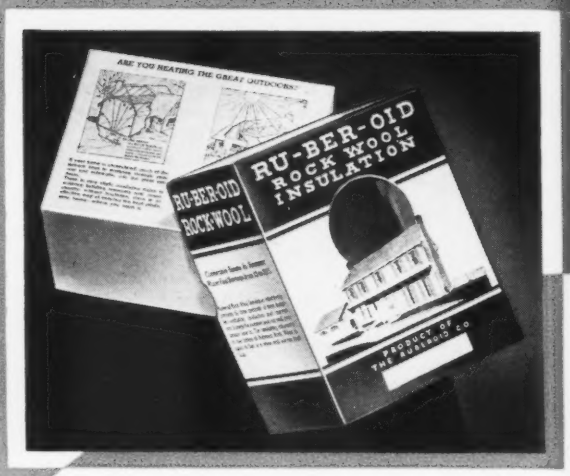
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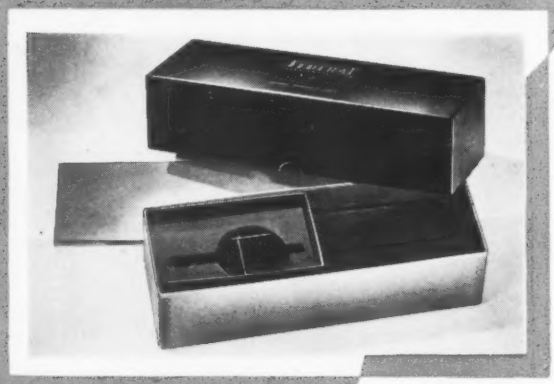
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26—Deep box of the telescope type used for samples of building material. All external panels convey sales messages. Cellophane window permits exhibit of contents.

28

27—Telescope box of extra-heavy construction for protection of replacement machine parts; extended gummed flaps prevent pilferage. Photo, Warner Bros. Co.



29

28—Fitted box for precision instruments, equipped with slotted partitions, trays and die-cut platform. Base has corners reinforced with metal; lid has corrugated pads for shock protection. Photo, Mason Box Co.

30

29—Group of utility boxes: (Upper left) Container for germicidal soap. (Upper right) Slide type of box with interior wood block tray to prevent flexing of contents. (Lower left) Deep box of slide type for proprietary remedy. (Lower right) Hinged box for medicated foot pads; hinge, of metalized paper, covers top and bottom of box—identity features are on top and directions for use on bottom. Photo, W. C. Ritchie & Co.



30—Window box with interior partitioning for clinical thermometer. Photo, Dennison Manufacturing Co.

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32

31—Shoulder box with tray for packing fruit cake is fitted with interior blocks for positioning contents. Lid is died out to permit visibility of contents. Photo, Old Dominion Box Co.

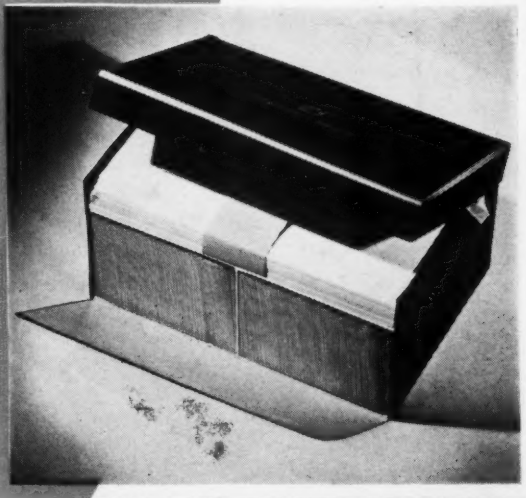


33

32—Deep telescope box for normal human blood plasma has compartments for two vials and end pockets for administering equipment. Corrugated liners afford added protection of contents. Photo, Walter P. Miller Co., Inc.

33—Shoulder kit box with hinged lid and tape tie; interior dividers provide for assortment of finger cots and aprons. Photo, Simplex Paper Box Corp.

34



34—Stationery box with hinged lid, drop front and tray, fitted with compartments for paper and envelopes. Photo, Walter P. Miller Co., Inc.

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Special set-up box types

In addition to the many kinds of set-up box discussed in the preceding pages, additional types have been specifically designed to fulfill special requirements. These include mailing boxes, metal edge boxes, fitted boxes, drawn boxes and transparent containers which permit full visibility of the product. Each of these is individually discussed below. In general, their basic functions and their advantages to the packager are similar to those of other set-up boxes.

Mailing boxes

by Ralph L. Harden

Containers used for postal shipments are generally termed "mailing boxes." Specifically, the term covers both folding and set-up styles made from fibreboard, corrugated board and paperboard. For the purpose of this article, however, we are considering only the set-up, paperboard type. In this category, the designation applies to small boxes (usually under 15 united in.), having some closing device which obviates the necessity for additional wrapping and tying, or sealing with gummed tape. Also, owing to the fact that ordinary grades of paperboard do not have the strength to impart sufficient protection, manufacturers specializing in this type of box use special grades of board having a wood pulp content which imparts greater strength to the finished box. The Mullen, or "pop" test, is the usual measure of strength of such boxes, as it comes nearer to duplicating the stresses usually found under mailing conditions.

The original closing device for mailing boxes was the metal fastener which was attached to the ends of the base, and protruded through small slits in the cover. Upon being bent down, the fasteners anchored the base and cover together, thereby doing away with additional wrapping and tying. These metal fasteners have been improved from time to time and the latest improvement is a fastener which is made from smooth wire instead of from flat stock. This overcomes the possibility of cut fingers from sharp edges.

Upon the increased use of sealed mail for packages, particularly for registered and air mail, such mailing boxes were also offered with sealing flaps which, being an integral part of the cover wrap, allowed the package to be sealed without use of further wrapping.

There are numerous variations and combinations of these two methods of closure which make possible a type of mailing container for use in every class of mail. For fragile merchandise or liquids of 4 oz. or under, either single or double corrugated linings are inserted in the boxes to give greater protection. For combination mailings where a first class letter must be enclosed, there are mailing boxes which include a letter compartment, or an envelope on the top of the box. Several types of mailing box are manufactured for returnable shipments. By means of a cut-out in the cover and a reversible address card, they provide for convenient return to the sender.

Metal edge boxes

by Malcolm P. Junkin

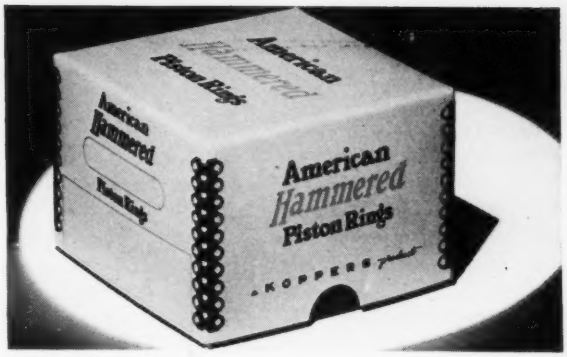
The metal edge box is a package of paradoxes. Firstly, it is not so much a package as a method of packaging, of handling materials and of inventory con-

PHOTO, COURTESY MASON BOX CO.



1—Paperboard mailing boxes deliver many products. Here are containers for samples, stationery and metal parts. The metal clip fastens the package securely and still it permits easy postal inspection.





PHOTOS, 2 AND 3, COURTESY NATIONAL METAL EDGE BOX CO.

2 and 3—The metal edge box arrives at the packaging plant as a flat and leaves as a stoutly set-up box which can stand up under hard treatment. It is extensively employed for the packaging of many metal parts.

trol. Secondly, though in its finished state it is definitely and stoutly a set-up box, it is, at first, just as definitely a folding box, and is generally classified as such. The fact is, it belongs in both classifications. Thirdly, though it is one of America's oldest distinctive packages, many improvements and developments, both in the packages themselves and in the method of employing them, contribute important new advantages to users in scores of different industries.

Reduced to fundamentals, the packaging method is most simple. Customers are supplied with box flats, usually printed in one or more colors, and scored for folding. As boxes are needed, they are assembled by unskilled labor on a stayer which joins and reinforces box edges with the metal stay that contributes so much to the strength and distinctive appearance of the boxes. Often the boxes are assembled or "made up" as a step in a production line, almost always at a point close to where they are to be used.

Metal edge boxes have many advantages, some of which are discussed in the following paragraphs.

For storage, one-tenth to one-fifth of the space usually required for set-up boxes is all that is needed for an equivalent supply of blanks for metal edge boxes. Enough flats to last for long periods of time may be stored and assembled as needed, thus obviating difficulties that are sometimes encountered when limited quantities of boxes must be ordered and received at frequent intervals.

Box waste and spoilage are virtually eliminated: made up only as needed, boxes are always fresh, clean and attractive when put to work.

Special treatment may be applied to make boxes resistant to moisture, acid and grease on the outside as well as grease- and acidproof on the inside.

These boxes are exceptionally light for their strength, reducing bulk and shipping costs. They may be easily handled by women workers. When they are used for mailing, they save postage.

Since no adhesive is employed, box edges stand up under humid conditions which tend to break down other boxes. The boxes are also unappetizing to vermin.

The quality of the fibreboard makes possible fine printing effects. The appearance of two- and three-color printing can be achieved with one and two impressions when colored board is used. Both the board and the metal stay are available in a range of colors.

Employing one basic system, boxes of many sizes and styles may be produced. They may be of practically any length and width, and may be 1–12 in. in depth. Styles include the full-telescope, one-piece hinge-lid, one-piece drop-front dispenser, pull-drawer shelf dispenser, full-telescope dispenser, one-piece hinge-lid lick mailer, one-piece sealing flap, drop-front triple-locked, partition, platform boxes and others.

Use of metal edge boxes for handling materials and as an aid in inventory control was given great impetus during the war and is being further developed.

Metal edge boxes are by no means inexpensive in initial cost. However, taking into consideration the stout protection they afford and the many economies and advantages inherent in the packaging method, a number of users assert that they are very economical.

Fitted boxes

by William H. Perry

A fitted set-up paper box is one to which sections, parts, partitions or other fittings are added for utility purposes, both functional and decorative. Fitted boxes are limitless in scope, ranging from the single part or scored form to a highly complex series of died-out parts, trays and partitions, which in turn can be treated with luxurious coverings.

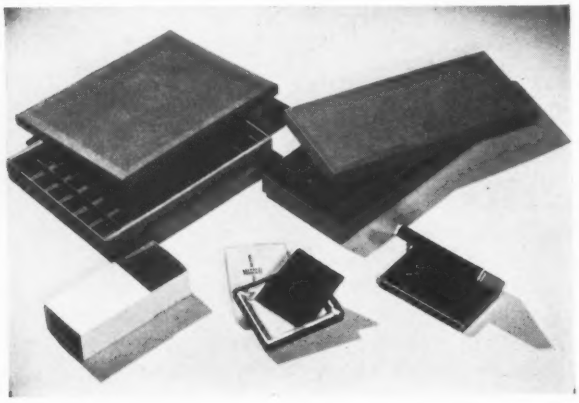
For example, the candy box, the hardware box or the pharmaceutical type having cross parts which are made by simply slotting boards at right angles, were used in expediting the assembly of highly technical wartime electrical and radar equipment either at the point of conversion into the finished product or as storage containers for parts in process. Such containers may hold the product either within a plant, or for shipment to outside subassemblies.

For demonstration purposes in physics laboratories and in general educational activities, one firm[1] has

[1] The Polaroid Co.

used some very complete and highly developed fitted boxes which very tangibly demonstrate the comprehensive scope of this type of container. These are illustrated in Fig. 5.

One box is solidly constructed and covered with a good grade of black paper on base and lid. The manufacturer's trade-mark is roll-leaf stamped in silver at the center of the lid and printed inside the cover in black on gray for identification purposes. The fittings in the base consist of a died-out form under which is an inverted form to hold the parts of the demonstration set which are shallow. The center section goes to the full depth of the container, again built to fit the part, while at one end is an oblong tray. The entire interior —base, lid, parts—is treated in gray, a color which gives the unit a professional look and is practical in constant use.



4—For utility or decorative purposes, the fitted set-up paper box has partitions or die-cut trays.

Other members of the same demonstration group, shown in Fig. 5, are subject to more constant use and are covered in black cloth. The identifying trademark is gained by the use of silk screening. The interiors of both the base and cover consist of trays and died-out forms, some of which are even covered with rayon flocking for the functional purpose of protecting the various films and lenses as well as giving dignity to the entire kit.

Within the larger projection-type kit is a box which in turn holds flocktreated partitions which are very definitely functional.

One of the best examples of a most highly developed fitted kit is the ladies' overnight case which is completely equipped with toilet or cosmetic articles. Such fitted kits are generally treated in washable finishes or fabrics and usually augmented with a removable mirror inside the cover, and with side pockets for retaining feminine gadgets.

The fitted kit for mechanical drawing implements is an outstanding example of a fitted container used extensively in industry and in educational institutions.

The family sewing kit remarkably demonstrates a functional as well as a decorative fitted kit.

Drawn boxes

by Gerald C. Hudson

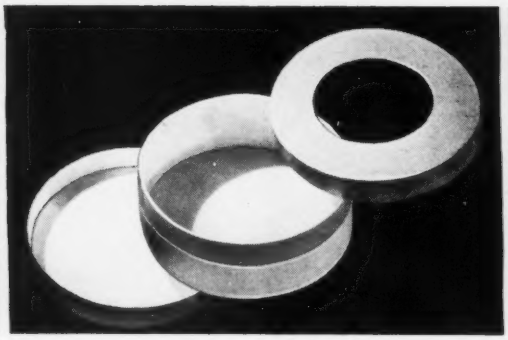
Wouldn't it seem foolish for motor car manufacturers to go back to the old way of making auto bodies from many parts instead of using the modern and economically produced single "monitor top" unit extending from hood to rear bumper? That question is quite pertinent to the field of packaging, since the process involved in the shaping of many of the component units in a modern

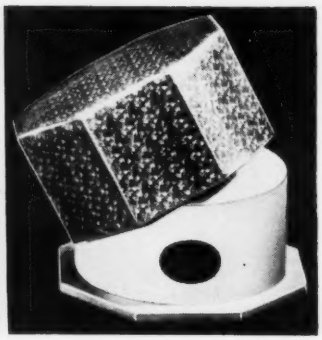
PHOTOS 4 AND 5, COURTESY CAMBRIDGE PAPER BOX CO.



5—Polaroid laboratory equipment comes in fitted set-up kits which serve both as sales containers and as strong reuse boxes which must last the lifetime of the instruments.







PHOTOS 6 TO 11, COURTESY HEMINWAY CORP.

6—(Left) Lids of double-wall drawn plastic film with decorative material between. 7—(Center) Base and top of this bath powder container are drawn fibreboard. 8—(Right) Powder container with window for visibility.

motor car is similar to a process now being used with increasing success in the manufacture of packages. It is the drawing process.

Better and sturdier units may be produced by drawing since it eliminates the possible weak spots and leakage lines which occur in items having many joints and seams. It also makes possible the combining of both structure and finished form in more intricate shapes than were formerly available. Once the "bugs" are licked for the production of a given item, drawing is faster, cheaper, far more susceptible to the demands of "smooth" modern designs, and a "natural" for mass production. Hundreds of items which were once built up of many parts are now made in one unit.

To make any component of a package by simply drawing the complete unit out of a single sheet of material, though not itself a new idea, is an idea which is now provoking new advances, new uses and new interest year by year. It is evident that the proportion of packages made by this method will increase greatly as its advantages become more generally understood. The trend of industrial design and manufacture is in the direction of designing products for unitary construction and producing them in a single operation, in place of assembling many pieces.

In the drawing of packages, a flat sheet of material is, in essence, forced into the desired shape. The necessary equipment is a press with a punch modeled in accordance with the internal shape of the part being manufactured and a cavity modeled in accordance with the external shape of the part. The sheet of material is placed between the punch and cavity which are then squeezed together. The sheet of material is thus drawn into the desired shape in a fashion very similar to that used in the fabrication of shaped products from sheet metals. Surfaces are smooth, generally free from wrinkles, rigid and strong.

The requirements of most packaging are such that the desired shape usually consists of a bottom (or top) with side walls extending directly up (or down) from it. This makes possible a very significant modification of the relation of cavity to punch, and results in a considerable extension of the range of sheet materials which can be used. The cavity can become a tube through



9—Decorative paper is applied to the exterior of these paper screw caps, constructed of drawn fibre.



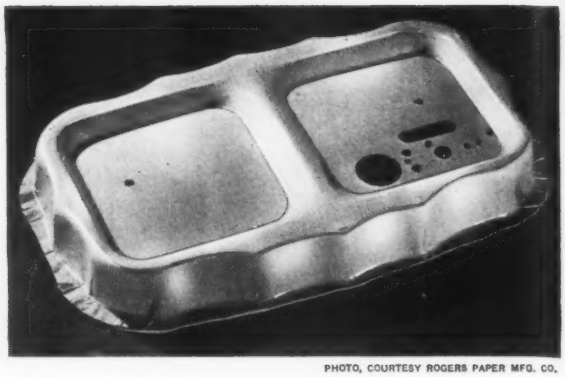
10—Drawn containers for various powders. Construction with bellows feature permits use as sprayer.

which the punch passes and against which, with great pressure, the material in the side walls is "ironed" out into a smooth, rigid rim. In packaging, this technically constitutes the true definition of a drawn shape component such as box, cover or form. Note that this tube version of the cavity does not preclude having a die, opposed to the punch, either below the tube or within it. The die may be stationary at the bottom of the cycle or may move down with the punch during the cycle. Thus, just as the side walls of the item can range in shape from a pure cylinder to the most complex of rim forms, so can the face (top or bottom) of the item be of almost any conceivable shape which can be impressed in the material between the punch and die.

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11—To carry cake makeup, this box has a base of opal glass; the embossed top is of drawn fibre.



PHOTO, COURTESY ROGERS PAPER MFG. CO.

12—Another packaging application of the drawing process is illustrated by this rigid fibre tray.

The formation of the face is virtually simultaneous with the formation of the side walls.

There is an increasing variety of available sheet materials which are suitable for use in the drawing process. Each has its own peculiar advantages and limitations. They can be classified generally as plastic sheeting and fibreboard, and there are various combinations of these that defy classification. Among the plastics most adaptable to the drawing process are ethyl cellulose, vinyl, cellulose nitrate and cellulose acetate sheeting. These materials all have good flow properties, particularly when properly preheated just prior to drawing.

Of the fibreboards, ordinary chip-pulpboard has been commonly used for drawing shallow covers for cereal boxes, tack boxes and similar containers. Today, however, new possibilities in packaging have been opened up by the recent development of special fibreboards having the qualities of high strength, high stretch, greater density, better moldability and improved dimensional stability—all of which make possible the manufacture of many more intricate and stronger drawn box shapes at greater speeds.

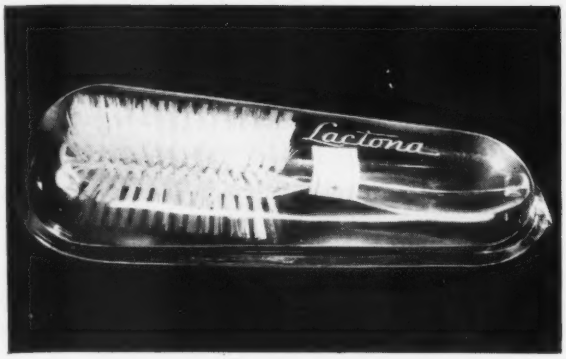
Correct heat and proper humidification and lubrication are essential for success in the drawing operation with these new fibrous sheetings. The drawn units may subsequently be covered with decorative papers or they may be spray painted or flock coated. Often, the sheet material itself can be supplied in colors which suffice for the final finish; and the surface of the item can be printed with any decoration desired, prior to the drawing operation.

Ben Franklin's first printing press could be used for the drawing process, as could virtually any punch type of press now used in industry. But any such makeshift approach will hardly do for modern production.

Companies specializing in drawing now use presses designed specifically for this kind of work. One concern imported a battery of such presses designed in France prior to the war. In peacetime, these turned out the fancy face powder boxes they were built to produce; in wartime they ran night and day turning out millions of drawn screw thread paper closures to replace metal ones on glass food containers. Presses vary in complexity from simple hand-operated ones to the power-driven and fully automatic types. Some are hand fed; some are automatically fed from rolls or from stacks of precut blanks. Modern drawing presses incorporate heating units controllable to the right temperature for each material being drawn (usually 200–400 deg. F.). They may include units for preheating the stock, as well as attachments for expelling the product and re-rolling the scrap.

The successful design of tools (punches, tubes and dies) for the production of each specific item is more a matter of long practical experience than of theory. The products to be made are so diverse and the many different sheet materials used are so varied in their properties, that success is possible only by close cooperation with product designer, toolmaker, press operator and materials supplier. For example, every material has a limit in depth to which it can be drawn without fracturing, but that limit itself varies with the gauge of the material, with its treatment, with the details of the item to be drawn and with the finish of the tools. At least one manufacturer has specialized in making fibrous sheet materials to meet the express requirements of the drawing operation. Even so, successful production depends greatly upon the subtle details of tool design, correct rounding of corners, clearances, cutting off elements, correct annealing and finish, and the like. There are some materials which will not work well in highly polished tools due to a sticking tendency.

Of considerable interest is a new type "puffer" package made by the drawing process. Two drawn cups with domed faces are glued or stripped together over a neck, after being loaded with powder. When a small opening is pierced through the rim, a quick squeeze of the fingers on the opposed domes produces a puff at considerable velocity of finely "atomized" powder. These neat and efficient containers have great consumer appeal and can be used for many kinds of powder: such as cosmetic powders, deodorants, dry perfumes, insecticides, dry flock sprays, graphite and medical powders.



13—For modern plastic brushes, drawn transparent containers afford maximum visibility and protection.



PHOTO, COURTESY TRANSPARENT CONTAINER CO

14—Elaborate perfume bottle and stand are appropriately set off by an arched acetate set-up box.

Visibility boxes

The technique of set-up box fabrication can be—and is—applied to fabricating containers of rigid transparent plastic material. The principal advantage of this container is visibility. This means, first of all, that the nature of the product contained is instantly identified. The beauty and appeal of the contents are enhanced. Unnecessary handling is prevented—and with some products, such as textiles, lingerie and cosmetics, this is of great consequence. At the same time, the package permits effective display on counter or in window, and in some cases provides a degree of consumer convenience.

But it is important for packagers to realize the limitations of this package. One is cost. The material itself is relatively more expensive, and the fabrication cost is somewhat higher, particularly for the drawn types. As a rule, hand or semiautomatic operations are necessary on the production line, which slow output and increase cost per unit. While these containers can be given adequate structural strength for most products, a limitation is the fact that some of the materials are not sufficiently impervious to moisture to serve for certain products. In some cases supplementary packaging is needed.

Prewar, the principal materials for transparent plastic containers were cellulose acetate, ethyl cellulose and vinyl sheeting. Cellulose nitrate has also been used, but its high combustibility necessitates caution in its use. Without a doubt, other new types of material suitable for these fabrications will be introduced, and it may be expected that some of the above-mentioned objections will be surmounted as new developments take place.

Most of the materials have been supplied in sheets or continuous rolls. Stock gauge range is 0.003–0.020 in., with heavier thicknesses obtainable on special order. Fabrication may be either by the set-up method or by the drawing method. In the former case, pieces are cut to proper size then sealed or cemented together. By the drawing method, the sheet is molded or formed in a single operation by means of dies under heat and pressure. The two methods of fabrication afford a wide variety as to size and shape. For quantity production, the drawn type offers advantages because the die, once made, will last indefinitely. On the other hand, the set-up type is adapted to short runs and permits changes in package structure and design.

Various methods of decoration are possible, including printing with special inks, beading, embossing, silk screen printing and roll-leaf stamping. Care in design is advised, to make sure 1) that the structure and decoration do not interfere with the visibility of the product, which is the principal advantage of this type of package and 2) that the ornamentation or decoration is properly adapted to the material.

15—A newly developed machine for the automatic drawing of plastics will greatly facilitate the manufacture of transparent packages such as these.

PHOTO, COURTESY CELANESE PLASTICS CORP.



Molded pulp containers

Molded pulp, traditional material for protecting eggs during shipment as well as for bringing the bakers' pies to market, has performed many new functional and decorative packaging jobs during recent years. It has been employed in a new package for standard electric light bulbs, and a new package for fluorescent light bulbs has used the material with success. Another important use is for the protective sleeves on liquor bottles.

In more uncommon shapes, molded pulp, made by the blown method, is used widely for making decorative novelty containers for candy, lingerie, hosiery and many types of dry merchandise for which an individualized container provides striking counter display. Some 10,000,000 molded pulp units, such as the pumpkins seen on candy counters, were sold in chain and syndicate stores annually prewar. Custom-made molds are often used for trade-mark identity.

Molded pulp containers have many advantages:

1. They are light in weight.
2. They may be seamless because two halves can be molded in one piece.
3. They are crush resistant.
4. They offer excellent opportunity for distinctive design and individuality of shapes.

Manufacture of molded pulp containers

New or reclaimed fibrous paper pulp is combined with binders of plastic resins or other chemicals in the manufacture of these containers. The paper pulp may be a mixture of sulfate and kraft, its strength depending upon the percentage of kraft in the mixture. The two major processes by which pulp is molded are:

Suction method—This process is employed for the mass production of flat dish types such as egg containers and the millions of pulp pie plates used annually by the baking industry. The molds, drilled with holes, are attached to the spokes of a rotary conveyor. A fine screen fits over the outside of the mold. As these molds move around the conveyor, they are submerged into vats of the pulp mixture. By suction, the required amount of the pulp mixture to make the container is lifted from the vat against the screen and pressed by male and female dies. The mold then moves on. The completed container is finally removed from the mold and put through the dryers. The entire operation is automatic, and it is possible to make large quantities with great speed and at very low cost.

Blown pulp—Some novelty molded pulp containers, such as boots, barrels, liquor bottle sleeves and figurines, are not formed with dies and plunger but are made by the blown-pulp method. A bronze shell or cavity drilled with holes is lined with a metal screen the same shape as the shell. The force of gravity causes the pulp mixture to fill this cavity and air pressure forces it against the screen within the mold where it is dried by means of air which has been superheated.

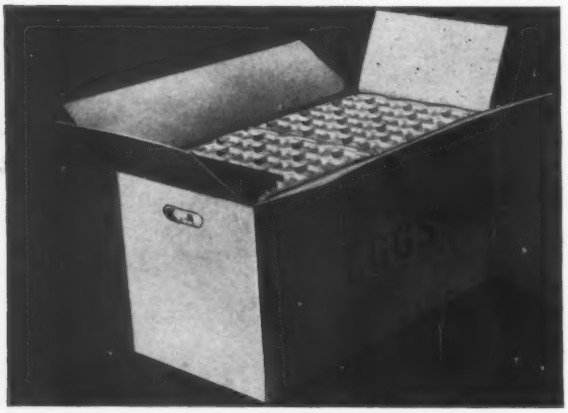
When the molded unit is dried sufficiently, the mold opens automatically. The unit is removed and passed along on a conveyor for further drying and decorating.

Color effects may be achieved by dyeing the pulp material to the desired shade or by applying color with a brush or spray. The containers may be lacquered to provide a high glossy luster. Lettering and trade-mark designs may be incorporated at the time of molding by novelty embossing or debossing.

Molded pulp containers may be made from stock molds. When an unusual design is required, an individualized mold may be made.

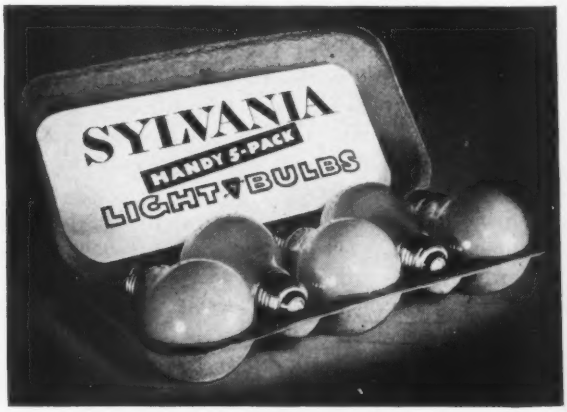
1—*Lightweight, crush-resistant molded pulp containers have long been standard for the shipment of eggs.*

PHOTO, COURTESY KIECKHEFER CONTAINER CO.



2—*Now electric light bulbs come to the consumer safely nested in attractive molded pulp packages.*

PHOTO, COURTESY KEYES FIBRE CO.



What to tell your box supplier

by T. S. Duncanson

Box manufacturers can serve their customers best only when very complete information is furnished along with a request for a price quotation or for the design of a new package. Innumerable factors enter into the designing of a package, and all of them must be considered by the box supplier. Before he begins to make his calculations, he must know the pertinent facts if he is to offer a package which is competently designed and developed and accurately priced. Our concern in this article, therefore, is to discuss the fundamental information which should be assembled before ordering a new folding carton, set-up box, fibre tube container or transparent package.

When requesting the development of a new package, always give the manufacturer samples of the article or substance to be packed. This will be a most important aid to him. It is surprising how often the box manufacturer, when he is asked to design and construct a new package, is merely told that the package is to hold a pound of this substance, a jar of this or that shape or four articles of such and such a size. This sort of information is, of course, entirely inadequate. It is essential that the product accompany the request.

Other important information which the boxmaker would like to receive is the price at which the article will be sold to the retail trade and the approximate contemplated expenditure for the new package. A knowledge of these figures will influence his choice of design and construction.

The boxmaker should be advised of the type of box contemplated, whether it be a folding carton, a set-up box, a fibre tube or a transparent package.

In cases where solid articles, such as bottles, jars, cloth pieces and so on, are to be packaged in boxes, it is well to advise the boxmaker of the position in which the article should be packed for display purposes.

Inform the boxmaker of the size of an initial order, and tell him the quantity that you eventually expect to use. This will help him to decide what method of manufacture he will employ, both in regard to the initial order and in regard to any anticipated larger quantities for future use.

If the boxmaker is expected to do the creative art work for the new package, suggest the color scheme or, if you have a standard color scheme, send along samples of this work. Give him a general idea of the desired design and copy—preferably in the form of a rough pencil sketch. With this as a starting point, he will be in a better position to proceed.

The above information is general data which any boxmaker really needs to possess when he is requested to develop a new package, whether it is to be a folding carton style, a set-up box, a fibre tube package or a transparent package.

Prices for established packages

When requesting a price for a package which has already been established, always send a sample of the package as well as the contents to the new supplier. Although you may give the usual specifications to a new supplier, it would be of mutual advantage for him to see the package as you have received it in the past. Often many things are built into a package which are not called for in general specifications, and the new supplier should have an opportunity to study these. There are also many things that *should* be built into a package which the proposed new manufacturer may suggest to your advantage.

Folding cartons

The general specifications needed for an intelligent quotation on folding boxes are as follows:

State the quantity to be purchased. In the case of two or three different folding cartons which can be run in combination, mention the minimum and maximum quantity of each that you would accept. This would give the manufacturer some latitude in laying out his combination run, which is to the purchaser's advantage in regard to price.

Specify the kind of board to be used: patent white, bleached manila, clay-coated, etc. Also specify the type of back: news back, manila back or white back.

Specify the finish, if any, for the inside of the carton: for example, wax or any special coating to be used for a special purpose.

Specify the construction, such as reverse tuck, straight tuck, glued end, etc.

Specify the exact size.

State whether the carton is to be hand filled or to be filled on fully automatic or semiautomatic machines. You might also mention the name of the filling machine you use. Most carton manufacturers have had experience on all types of filling equipment.

Specify the number of colors in the design. Also specify the finish: overprint varnish, spirit varnish, lacquer or any other unusual finish that you may require.

If the product has already been packed in a folding carton, by all means send a sample.

By sending a sample it will be possible to indicate whether or not the specifications are supposed to apply to that carton. In this event, the cartonmaker will be in a position to check them against the sample, or to indicate in what respect the specifications are intended to depart from the sample.

Inform the manufacturer whether or not you can supply working drawings, original plates, electrotypes, lithographing positives or negatives, original sketches

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or any work or material used in the past for reproducing the design. These factors all affect the price of the carton. If it is not possible for you to supply anything along the line of art work or plates, mention this fact in your inquiry. This will avoid misunderstandings and will also permit the manufacturer to make his operational plans accordingly.

If you require special packing specifications such as tray packing, tying, bundle wrapping, or corrugated cases of special size, this should also be known by the manufacturer at the outset.

Specify the f.o.b. point. Also, inform the boxmaker whether you are in a position to take the entire run in one shipment or if you require delivery over a period of time. If the quantity is substantial and the boxmaker does not have to provide storage but can ship lots as manufactured, this will also have a bearing on your price. Details of this nature should be supplied for the manufacturer's full consideration before contracting for the new boxes.

Set-up boxes, fibre tubes, transparent packages

The general specifications as to size, shape, construction, quantity, etc., are the same for set-up boxes, fibre tube containers and transparent packages as those for folding cartons. There is, however, additional specific information with which a boxmaker would like to be supplied when he is requested to make samples and to quote prices on any of these three types of package.

Set-up boxes—In the case of the set-up box, the following suggestions are made:

If it is an established package, by all means send a sample to the boxmaker indicating, of course, any changes that you may have in mind.

If it is your intention to ask for an improved construction or for a cheaper construction, give in detail your ideas along these lines.

Many set-up boxes of round, square or odd shape are now being made on automatic equipment if the quantity will warrant the machine setups. It is wise, therefore, to inform your boxmaker of the initial quantity you propose to purchase and also to tell him the quantity that you have used or anticipate using during the period of a year. The boxmaker may be in a position to offer you a substantial saving by making the boxes automatically, if you can purchase six months' or a year's supply.

If the box has printed or lithographed wraps or labels, inform the manufacturer if these will be supplied by you or if they are to be supplied by him. Of course, if the box manufacturer is to supply the labels, give him complete information as to whether or not you can furnish any of the original plates or engravings necessary for the reproduction.

If you are to supply the lithographing, it is always best to have your boxmaker work closely with your printer or lithographer. This will avoid a good deal of misunderstanding in the future with regard to incorrect layout, cutting sizes, positioning and other such factors.

When requesting a new combination set-up box, outline to the box manufacturer the approximate shape and construction you have in mind. Tell him if you want a round, square, telescope, shouldered or lid style. Also explain the position in which you would like the articles displayed, for example, state whether the merchandise will be lying flat or standing up.

Set-up boxes can be constructed in a wide price range. Therefore, inform the box manufacturer in your original inquiry the approximate price you wish to spend for the set-up box. Without this information, his first efforts may be futile.

Many set-up boxes of all sizes and shapes are packed in individual or multiple containers. Give complete specifications as to the container packing, if any, and also state other special types of packing which you may require.

Fibre tube packages—When requesting a quotation on a fibre tube container:

Send along a sample of the article to be packaged. If the article or substance has not been previously packaged, inform the manufacturer of the approximate sizes and shape you require. It may be necessary for him to alter these slightly to fit his equipment, and this should be known prior to contracting.

Indicate to the manufacturer what type of top and bottom closure you prefer and also whether or not you would like the bottom closure or top closure sent separately for filling purposes.

In the case of powdered or granulated substances, the boxmaker will probably wish to make siftproof tests. Send him a sufficient quantity of the product for such test purposes.

Give him complete details as to the characteristics of the material. Tell him if it will lose its odor when package is not airtight, or if the material is hygroscopic. Advise him of any other peculiarities of the substance to be packed.

Transparent packages—Many new packages of this type are now offered. When requesting information on this type of package:

Send the articles or substance to be packed and give the box manufacturer an idea as to the shape and construction you have in mind.

Tell the boxmaker the price range permitted for the new package. This is important so that he can decide immediately whether the package can be made from transparent material or whether a combination of transparent material and cardboard will be better.

Specify the quantity required.

Give information regarding printing copy and give other general information so that the boxmaker can make a complete quotation.

If the purchaser of packages will work more closely with his supplier and give him more complete information of the type described above, much time will be saved in the development of new packages, better packages will be produced, and a good deal of misunderstanding will be avoided.

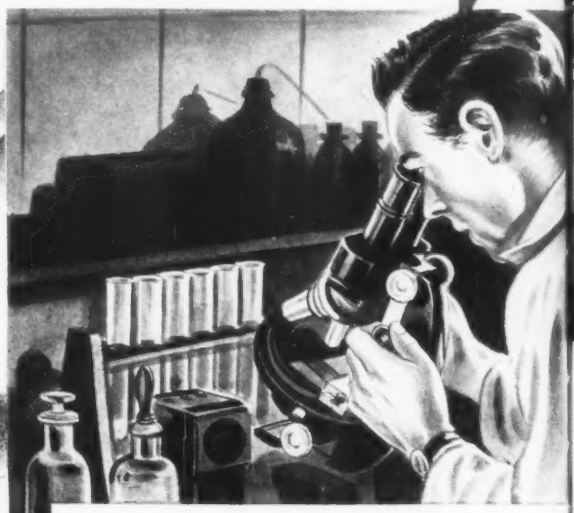
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ADVERTISING FOR CARTONS and BOXES

Why many of America's largest folding carton users turn to G-R

... FOR THE DEVELOPMENT AND STYLING OF FINER FOLDING CARTONS





CARTON IDEAS. Gardner-Richardson packaging experts have been responsible for many outstanding carton developments in recent years—snap lock cartons, dispensing cartons, bulk display cartons, cartons with pouring spouts, automatic lock ends and many other sales and service features.

Technical Research. In Gardner-Richardson's laboratories, technicians are continuously at work, developing new paperboards and new methods for better packaging. They also check raw materials and manufacturing processes to make sure specifications are rigidly observed, assuring uniformity and unvarying quality in the finished carton.

SPECIALIZED CARTON BOARDS CREATED BY GARDNER-RICHARDSON

Coated Lithwite. The first carton board ever made and coated in one continuous, high speed operation. Smoother. Whiter. Rub-resistant. Prints with unusual color brilliance. Proved and improved for over seven years.

Greasene. For the economical protection of products with grease or oil content.

Hydrotite. A special board for products which need moisture-vapor resistance.

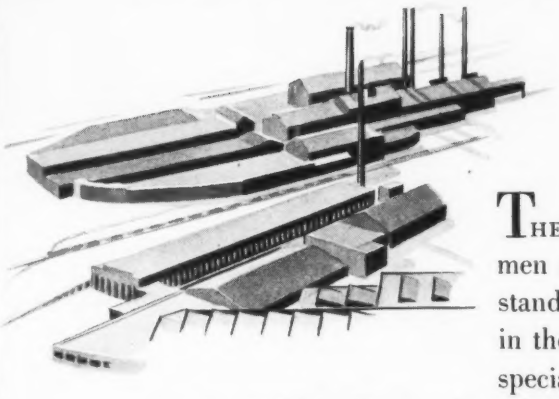
Gardner-Richardson also manufactures a full line of standard grades of boxboard and specially treated boxboards.



More carton-development know-how! It's hard to stump Gardner-Richardson packaging experts — even with the most complex carton problems. Hand them a problem of simplifying assembly, increasing carton utility or product protection — and their experience, ingenuity and technical skill will more than likely produce the answer.



Sales-slanted Carton Display! Gardner-Richardson artists know that the day of the "Silent Salesman" package is past. That in today's modern mass displays a carton must speak up and sell. Whether they're designing a new package or redesigning an old one, G-R artists see that packages have *buy* as well as *eye* appeal.



THE RESOURCES of Gardner-Richardson, in men and machines, are among the most outstanding in the folding carton industry. Here, in the two well equipped plants, you will find specialists in every phase of paperboard and carton making. From pulp to finished product, they work as a team to produce cartons which measure up to Gardner-Richardson standards—and to yours. Proof that these standards are uniformly high, is the fact that year in and year out Gardner-Richardson cartons bear the names of many of America's most famous products.

The GARDNER-RICHARDSON Co.

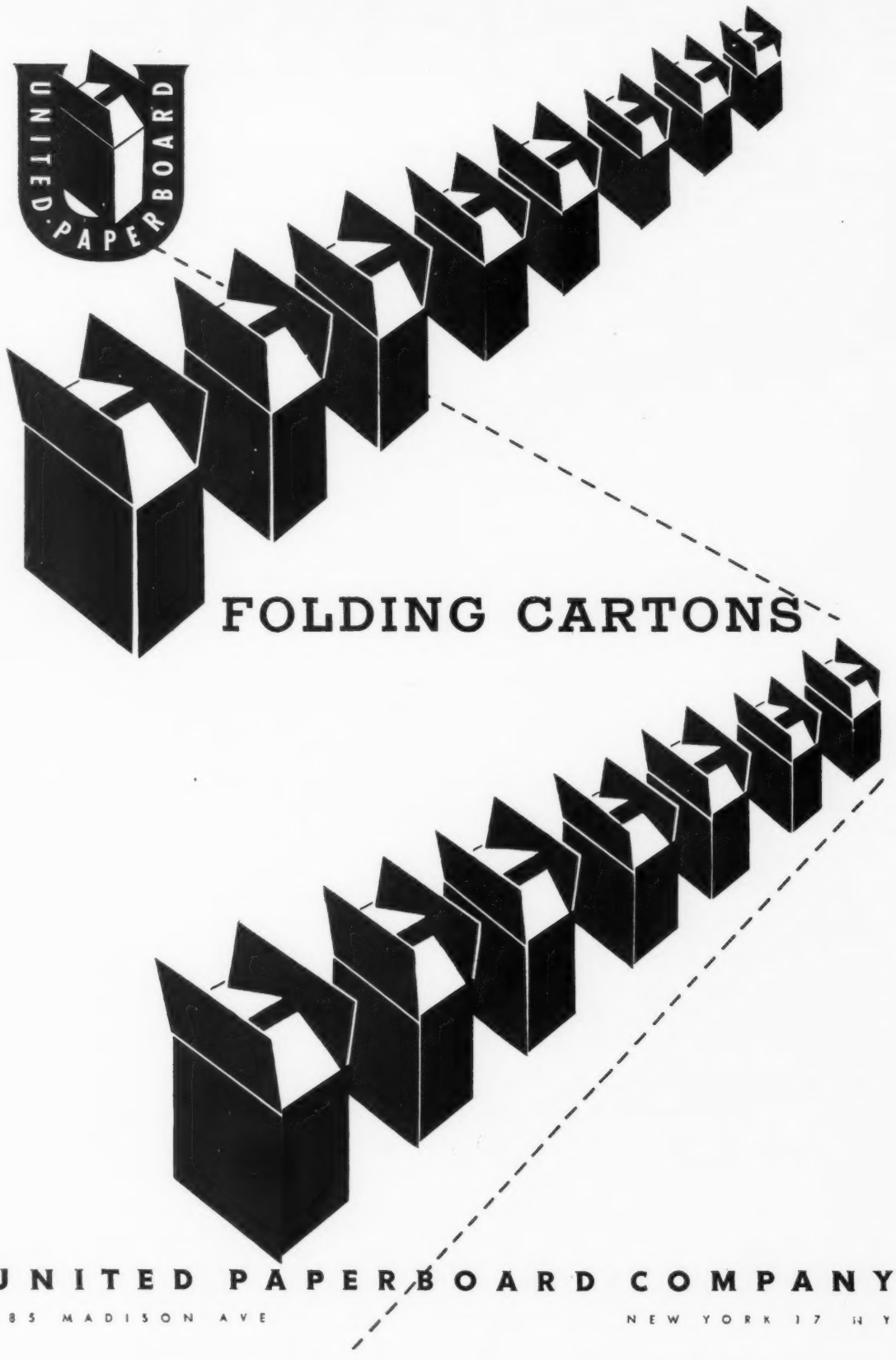
Manufacturers of Folding Cartons and Boxboard • Middletown, Ohio

Sales Representatives in Principal Cities: Philadelphia • Cleveland • Chicago • St. Louis • New York • Boston • Pittsburgh • Detroit

XUM

Michigan
Cartons have a
reputation for
doing a better
job of protecting
. . . . a more
thorough job
of selling.
They
can do
as much
for you!




UNITED·PAPER·BOARD
FOLDING CARTONS
UNITED PAPERBOARD COMPANY
285 MADISON AVE
NEW YORK 17 N Y

XUM

FIDEL-I-TONE . . .

Reg. U. S. Pat. Off.

DIRECTLY ON BOX

New and Unique

FIDEL-I-TONE is the *new* and *unique* graphic arts process which unfolds far-reaching possibilities for the package designer. It reproduces actual color photography with amazing clarity.

Adaptable

FIDEL-I-TONE is adaptable to a very wide range of printing materials—*including ordinary boxboard!* For the first time in folding box history the designer of a new package can "shoot the works" without fear of disappointment!

Screenless

FIDEL-I-TONE regularly employs halftone rulings of up to 200 or even more lines per inch. Because consciousness of screen-pattern is completely eliminated, reproductions are extremely vivid and realistic.

Economical

FIDEL-I-TONE is truly economical and well within practical price range for large-volume users. Its costs compare favorably with those of conventional reproduction processes.

Folding Boxes
• *Labels* •
Inserts

Originators of FIDEL-I-TONE . . .
the high fidelity color reproduction process.

XUM

produces results like this . .



When this Q-T Pie Crust package hit the market, soaring sales proved the sensational power of color photography to move food products. Taylor-Reed Corporation reported: "Portland (Me.) test—Q-T moved out as fast as it was put on the shelf." One dealer wired: "Ship me 1000 cases to start, and if they don't sell out in a week you can have my job!!"

You owe it to yourself to investigate what **PICTORIAL PACKAGING** can do for your product. A **FIDEL-I-TONE** reproduction can lift your package out of the commonplace . . . make it a winner in the fierce "shelf battle" . . . move it into the shopping bag of Mrs. America!

Write us for details. We have prepared an attractive, filing-size portfolio of **FIDEL-I-TONE** samples. It's yours for the asking!

The Lord Baltimore Press

1500 GREENMOUNT AVE., BALTIMORE 2, MARYLAND

SALES OFFICES: 595 MADISON AVENUE, NEW YORK 22, N. Y.—ELDORADO 5-4180

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HELP FOR NEW PRODUCTS READY TO TAKE THEIR FIRST STEP

One of the first considerations in marketing a new packaged product—is the PACKAGE. What form will that package take? What will be its functional design? How can it be given the necessary sales appeal to compete favorably with competitive products at point of sale? These, and other important packaging considerations have a fundamental bearing on both the production and merchandising success of your new postwar product. For more than 75 years U. S. P. & L. has been creating and producing quality packaging materials for many of the country's leading manufacturers and distributors of packaged products.

Call on this experience to help solve your packaging problems. Phone, wire or write for a "U-S" representative today.

U S P L

COMPREHENSIVE PACKAGING SERVICE

. . . includes all phases of packaging design and production . . . origination and checking of product trade name . . . development of the package design along sound merchandising principles and correct functional applications . . . selection of proper materials for maximum efficiency and practicability in manufacture . . . highest quality production . . . dependable delivery. This Comprehensive Packaging Service is backed by 75 years of experience in which U. S. P. & L. has served many of the country's leading users of packaging materials.



THE UNITED STATES PRINTING & LITHOGRAPH CO.

EXECUTIVE OFFICES: 384 BEECH ST., CINCINNATI 12, OHIO

SALES OFFICES IN PRINCIPAL CITIES

5 GREAT "U-S" PLANTS PRODUCING QUALITY PACKAGING AND ADVERTISING MATERIALS

Heminway SERVICE

FROM DESIGN TO PERFECT PACKAGING



Our seventy-five years of box and printing experience enables us to develop for you the perfect package for your products.

- CANISTERS • PAPER DRAWN PRODUCTS
- SET UP BOXES • CATALOG PRINTING
- NOVELTY BOXES • ROUND BOXES

HEMINWAY CORPORATION

30 ROCKEFELLER PLAZA, NEW YORK 20, N.Y.
FACTORY • WATERBURY, CONN.

XUM



A COMPLETE PACKAGING SERVICE!

PRECISION BUILT SET UP BOXES
FOLDING CARTONS SPIRAL WOUND
CONVOLUTE AND CORRUGATED

OLD DOMINION approaches your packaging professionally: a complete service that analyzes your product and problems, and scientifically solves them — assuring you the right box for the job. Whether you require set-up, spiral wound, corrugated or folding boxes, our packages offer the best features for shipping, safety, and selling. Old Dominion's forty years of experience, product research, and an able engineering staff, plus nine plants strategically located, are at your service.

OLD DOMINION *Box Company Inc.*

PLANTS LOCATED THROUGH THE SOUTH
NEW YORK REPRESENTATIVE
228 EAST 46th ST., NEW YORK 17, N. Y.

CHARLOTTE • N. CAROLINA

PRECISION BUILT PAPER BOXES AND PACKAGING MATERIAL



Hands demand
what eyes select...

A multitude of eager, searching, wanting hands are reaching out toward the tempting arrays of long awaited products on American counters.

The hands desire . . . the products . . . but the eyes select.

The eyes are hungry, hungry for beauty, for charm, for the original and unique. They're searching eyes but they're calculating too. They compare and judge with caution and care, for their expectations are as high as their urging desire is great. As their decision is made . . . the hands demand.

Now, we ask, will it be your product that those eager hands claim? Will it be your product that holds selecting eyes in a bond of beauty and charm and with a promise of desires fulfilled?

If your product has been appareled and packaged by WARNERCRAFT you may rest content . . . for a multitude of wanting hands . . . strong hands, fragile hands, hands beautiful, hands possessive, will demand the product that you present.

WARNERCRAFT

"THE FINEST WORD IN PACKAGING"

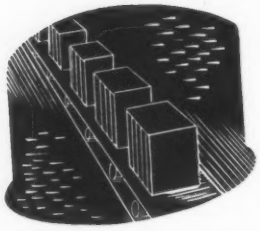
Makers of set-up and folding boxes of all types, transparent acetate containers, hand made specialties, counter displays and dispensers.

THE WARNER BROTHERS COMPANY

Main Office and Factory: 325 Lafayette Street, Bridgeport, Conn.
New York Sales Office: 200 Madison Avenue, New York, N. Y.

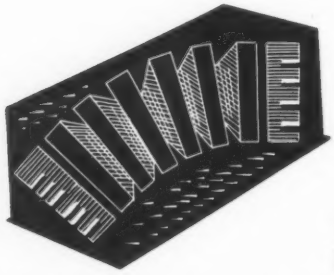
F. N. Burt Company

CREATIVE SOURCE FOR...



...HAND-MADE SET-UP BOXES

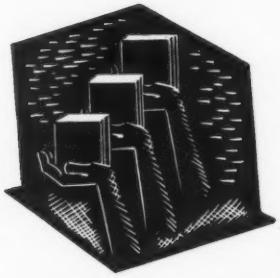
Beautiful, high-quality containers for cosmetic and toiletries packagers are produced in a special F. N. Burt division. These hand-made boxes are the finest money can buy. They are used to help sell many of America's luxury products.



...FOLDING CARTONS & DISPLAYS

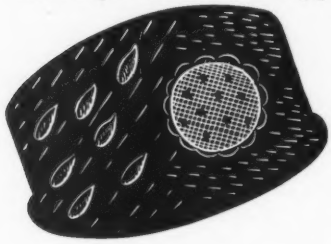
Another Burt packaging division turns out large quantities of folding cartons and counter displays for packagers of nationally merchandised products.

XUM



...AUTOMATIC SET-UP BOXES

Small square, round, oval and oblong set-up boxes produced in large quantities with perfect uniformity of size, shape and color on our own specially designed automatic equipment. Many of the largest users of set-up boxes rely on Burt's automatic production to supply their mass-marketing needs.



...SPECIAL COATINGS & CLOSURES

F. N. Burt resourceful package engineering constantly creates original, salesworthy packaging specialties. *Lam-lac* is Burt's exclusive high-gloss coating. Applied to packages and displays, it offers a surface of brilliant lustre, is moisture-proof and greaseproof as well.

A number of special plastic closures have been developed by Burt engineers. Some are applied to expensive boxes, others are used on powder-dispensing containers. Each is unique; a powerful sales weapon to help your packages win the battle for sales.

Call or write for samples.

F. N. BURT COMPANY, INC.

500-540 Seneca Street, Buffalo, N. Y.

New York City • Philadelphia • Boston • St. Louis • Atlanta • Chicago • Cleveland
Cincinnati • Los Angeles • New Orleans • Memphis • Minneapolis • Kansas City
San Francisco, California • Newark, New Jersey

CANADIAN DIVISION:

Dominion Paper Box Company Ltd., 469-483 King St. W., Toronto 2, Canada

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Whatever Package Your Product Needs

You get the benefit of a scientific "clinical" recommendation when you send your packaging problems to Sutherland. In one integrated plant there are package engineers who specialize in custom built packages made from laminated or special treated boxboard, cylindrical liquid-tight containers, cups, plates, trays. Each protection requirement of your product is thoroughly analyzed. Labor-saving mechanical filling machinery can be utilized. Experienced artists go into every angle of merchandising appeal. And you get, of course, the economy and efficiency of controlled production from pulp to paperboard, through printing and final finishing.

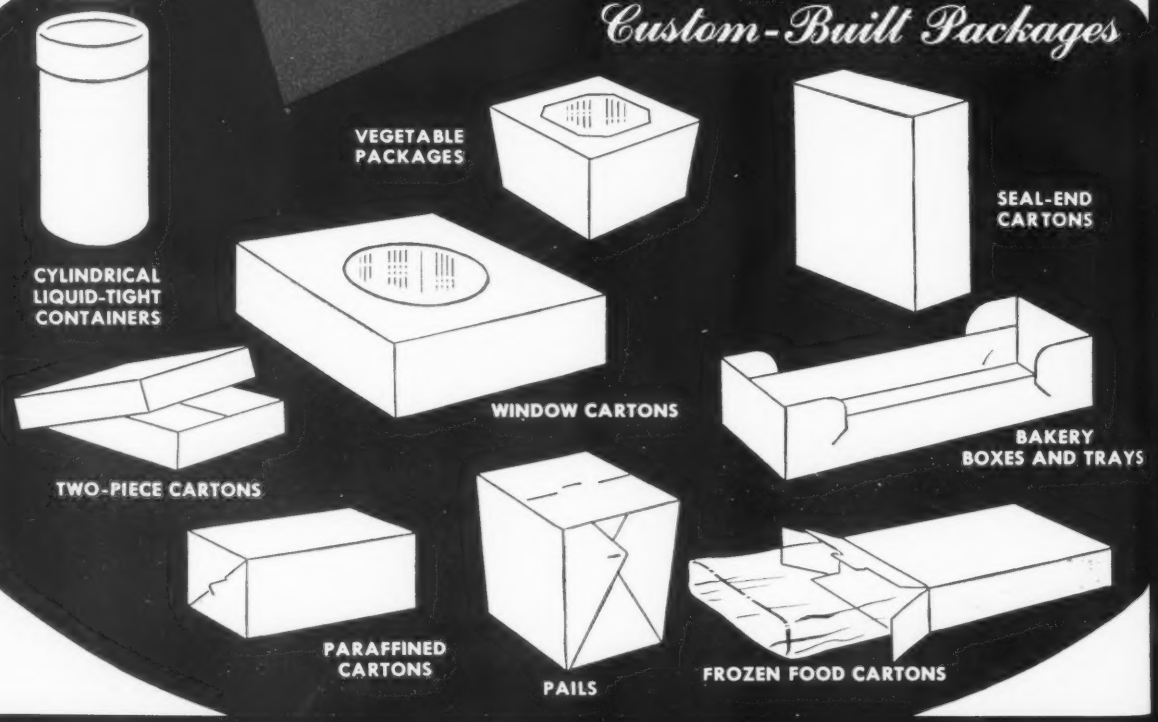
Ask Sutherland for recommendations on your next packaging problem

SUTHERLAND PAPER CO.

KALAMAZOO 13D, MICH.

SUTHERLAND PAPER CO. KALAMAZOO MICH.

All Styles of Custom-Built Packages

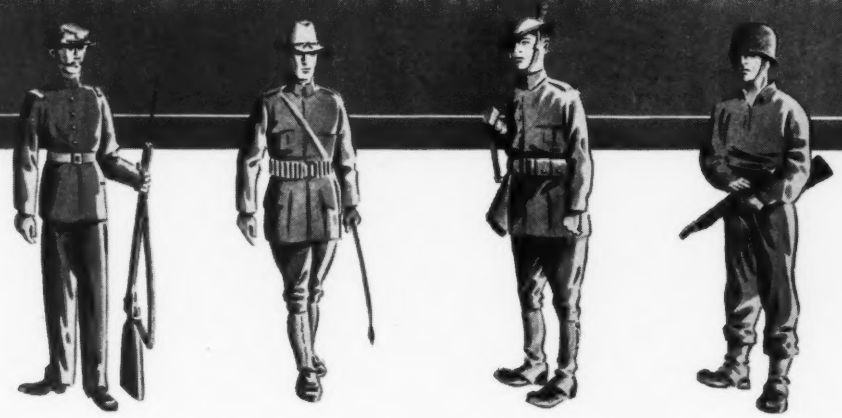


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TRAYS

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BUTTERFIELD-BARRY PAPER BOARD DISTRIBUTED THROUGH FOUR WARS CONTINUES UNINTERRUPTED SERVICE



The Butterfield-Barry Company is pleased to announce the return of Royal Satin, the aristocrat of set-up boxboards. Royal Satin is available in limited quantities from both our New York warehouse and our mill. Set-up box makers and users alike can now, once again, plan for quality containers built of the finest boxboard available.

Tredonia lined board is another Butterfield-Barry specialty. This moisture-proof and grease-proof board builds sturdy resistant containers of both the folding and set-up types. Sheet lining is performed at our New York plant and in our mills. This special service is offered in both regular and single and double sheets.

For 93 years, our name has been synonymous with quality boxboard and reliable service. Samples of our material will be gladly sent on request.

THE BUTTERFIELD-BARRY COMPANY
Incorporated

174-176 Hudson Street — New York 13, N. Y.

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THERE ARE MANY WAYS OF USING LUMARITH® FILM

LUMARITH FILMS

do not dry out or become brittle with age
are dimensionally stable
retain their sparkling transparency
are germ, mold and fungi resistant
are waterproof and greaseproof
have ideal surface for multi-color printing
are odorless, tasteless and non-flammable
will not tarnish metal surfaces

The crystal clear container and the window box are but two of the many packaging methods to which Lumarith is adaptable. Transparent set up boxes of all types, laminated boxes, metal edge boxes, spiral wound and drawn containers pack a selling punch when made of Lumarith. Lumarith film—tough, easy to draw, form and cement—is a versatile packaging material.

LUMARITH SHEETS AND MOLDING PLASTICS

Lumarith molded and fabricated sheet containers provide the ultimate in product display and protection. For special effects, intricate designs and extra strength

SEE OTHER CELANESE ADVERTISEMENTS
PAGES 269, 482-3, 669

LUMARITH®



...Windows

TO *PROTECT, ATTRACT, PERSUADE*



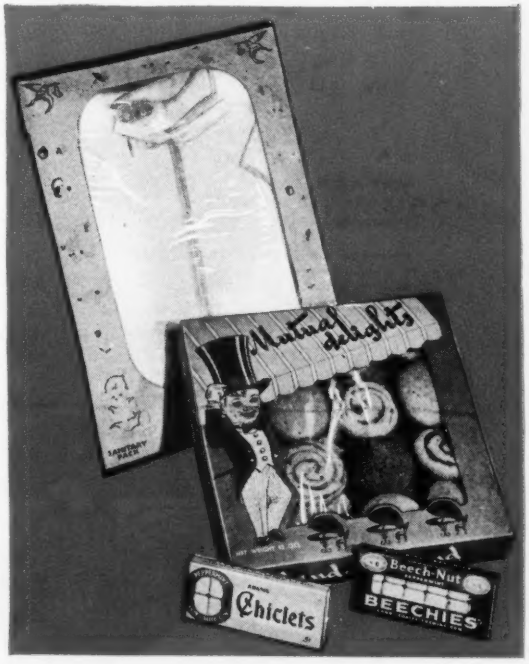
requirements, the molded or sheet container has many points of advantage.

WRITE FOR BOOKLET

Send for LUMARITH PLASTICS PACKAGING BOOKLET. It is a practical idea book for converters and product manufacturers. Celanese Plastics Corporation, a division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y.

A Celanese® Plastic

®Reg. U.S. Pat. Off.



CARTONS THAT SPEAK OF QUALITY AND VALUE!



Your carton must do a selling job today. On dealers' shelves and counters it must speak of quality and value if it is to move at the moment of decision. That's why your product should be packaged in A.C.M. Clay Coated Cartons. A.C.M. is the world's finest, most uniform Clay Coated Board. Made by an exclusive, continuous process, with a pure white, velvet-smooth surface that gives lustre, brilliance and perfect reproduction to any design in either letterpress or lithography.

WHY A.C.M. CARTONS ARE BEST:

Whiter board—
velvet-smooth surface—more rigid—
tougher—better folding qualities—
greater lustre and brilliance—
perfect reproduction in either letterpress or lithography.

AMERICAN COATING MILLS

Main Offices and Plants—Elkhart, Indiana. Branch Plant—Chicago. Branch Sales Offices—Wrigley Bldg., Chicago; 271 Madison Ave., New York City.
Subsidiary—Modern Packages, Inc., Memphis, Tenn.

The Secret is in the SURFACE

AMERICAN COATING MILLS

A.C.M. CLAY COATED CARTONS AND CARTON BOARD

XUM


XUM





THE TIME HAS COME,
THE WALRUS SAID,
TO TALK OF MANY THINGS,
OF CARTONS FOR STAPLERS,
HAIR POMADE,
COLOGNE AND APRON STRINGS.

BROOKS & PORTER, INC.

304 HUDSON STREET • • • • NEW YORK, N. Y.

Packaging and Display Specialists for half a century

XUM

THE IDEA CAME FIRST



An Idea must exist in the mind of its Creator before it can come to life and assume physical shape and significance . . .

as in

SPECIALIZED PACKAGING
CREATIVE FOLDING CARTONS
INTRIGUING SET-UP BOXES
UNUSUAL MERCHANDISE COUNTER DISPLAYS
ROUND BOXES

ACME PAPER BOX COMPANY
STATE AT SIXTIETH ST., CHICAGO 21, ILLINOIS
CREATORS • DESIGNERS • MANUFACTURERS

The Better the Product, the More Important the PACKAGE



XUM

THE PACKAGING *that Attracts!*



There's a secret, of course, back of the success of ACE Cartons. In a word it's—*appeal!* And when you dismiss your packaging headaches into the hands of ACE you cash-in on unusual manufacturing facilities, an inspired craftmanship, and a *practical* planning that provides maximum merchandising appeal for the job that lies ahead.

ACE CARTON CORP. ACE CHICAGO *Creators*

ACE CARTON CORPORATION

5800 West 51st Street, Chicago, Illinois

FOLDING PAPER CARTONS · FOLDING DISPLAYS · DISPLAY CONTAINERS

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ALFORD CARTONS

FOLDING CARTONS OF DISTINCTION

DEVELOPERS AND MANUFACTURERS

of

QUALITY FOLDING CARTONS

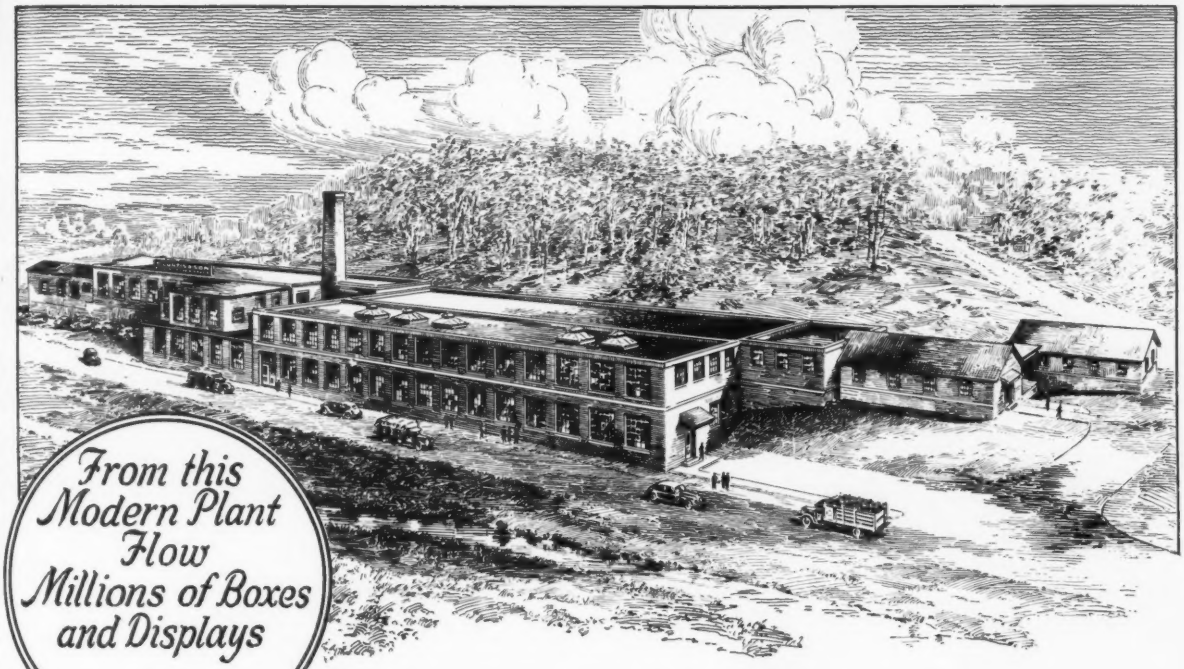
for

QUALITY PRODUCTS

ALFORD CARTONS

SUBSIDIARY OF CONTINENTAL PAPER COMPANY

RIDGEFIELD PARK, NEW JERSEY



From this Modern Plant Flow Millions of Boxes and Displays

S. Curtis & Son, Inc.

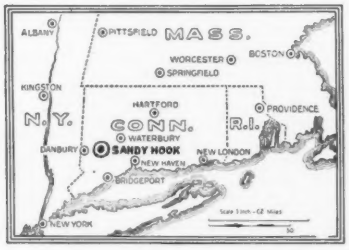
ESTABLISHED 1845

QUALITY FOLDING PAPER BOXES

Over One Hundred Years of Dependable Service

S. CURTIS & SON, INC. EST. 1845 SANDY HOOK, CONN.

TO all points go daily the output of a plant equipped to produce every kind of folding box and package display. We have functioned for a century on the same site, through wars and depressions, with descendants of the founder always actively engaged in management. Large or small, your order is assured prompt, careful handling.



Within convenient trucking distance of Connecticut industrial centers and the New York Metropolitan area . . . prompt delivery throughout New England and New York State.

Main Office and Factory
SANDY HOOK, CONN.
PHONE: NEWTOWN 93

NEW YORK OFFICE • 342 MADISON AVENUE • NEW YORK 17 • PHONE MURRAY HILL 2-2876

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SET-UP BOXES

4 Key Reasons



XUM

Speed

Automatic Production

Economy

Uniformity

Our automatic production of a wide variety of shapes of small set-up boxes plays an important part in the packaging plans of some of the country's leading brands. We manufacture automatically not only paper and board boxes but transparent acetate containers as well—all shapes and sizes. Because our packages are *automatically produced,* they are manufactured speedily and with great economy. And because our automatic production is so well controlled, our output is uniform with no variation from the first package to the millionth in the same run.

IMPERIAL PAPER BOX CORP.

252 NEWPORT STREET, BROOKLYN, N. Y.

and affiliated companies

HEPPE-HUDSON
191 Washington Street
Jersey City, N. J.

HESS-DENSEN, INC.
129 West 20th Street
New York, N. Y.

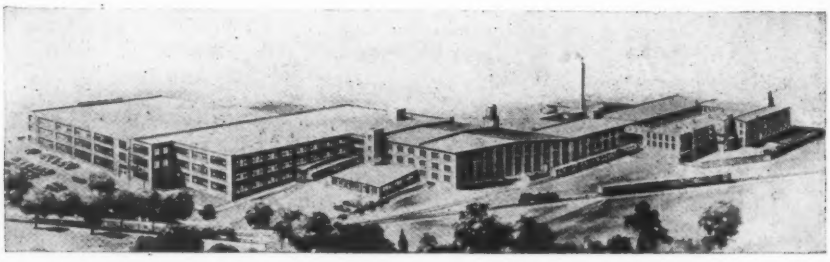
CLOGSTON PAPER BOX CO.
102 Hill Street
New Haven, Conn.

QUARTIN SPECIALTY BOX CO.
198 Hopkins Street
Brooklyn, N. Y.

XUM

- *Set-up boxes*
- *Folding cartons*
- *Transparent containers*
- *Cigar boxes*

LePACO Laminated Board, moisture and grease-proof boards, litho clay coated, flints and other unusual surfaces. Created to help fill your packaging requirements.



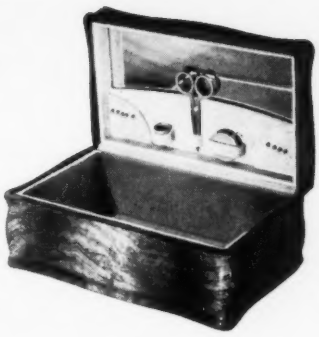
LEBANON PAPER BOX COMPANY

LEBANON, PENNSYLVANIA

New York Office, 51 Madison Ave.







WOOD
STEPS UP
Good Looks



For "class" packaging, no other medium gives the warmth, the distinction, the natural beauty of skillfully-worked wood boxes. In tiny ring boxes . . . in massive, magnificently finished silverware chests . . . in a host of other designs and shapes and sizes for packages of permanence . . . Pilliod master craftsmanship in wood plays an important part in displaying a great variety of products to best advantage—in inducing increased *sales*.

The
FINEST PACKAGES
GROW ON
TREES

DESIGNED BY THE **PILLIOD** CABINET COMPANY · SWANTON, OHIO

XUM

Fine set-up boxes

WALLACE PAPER BOX CORP.
NEW YORK CITY



Quality + Service

FORT ORANGE
PAPER CO.
CASTLETON ON HUDSON, N.Y.

475 FIFTH AVENUE
NEW YORK

STATLER BUILDING
BOSTON

THERE IS NO FINER COSMETIC CONTAINER THAN A KARL VOSS BOX



Karl Voss Corporation

HOBOKEN NEW JERSEY

MANUFACTURERS OF PAPER BOXES

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XUM

31 YEARS OF SERVICE



FOLDING BOXES

DISPLAY CONTAINERS

"Designed to Sell on Sight"

We will solve your difficult packaging problems by applying the knowledge and ability acquired by us through the years. Our outstanding creative designs assure successful merchandising.

ACME

FOLDING BOX CO., INC.

ESTABLISHED 1914

141 EAST 25th STREET

NEW YORK 10, N. Y.

MURRAY HILL 6-7520

"The Proof IS IN THE EATING"



. . . AND R. T. G. CASE HISTORIES ILLUSTRATE THE POINT

It is difficult to talk of package design without dwelling at length on beauty. But a package possessing beauty alone is not necessarily an effective package. An effective package is one that makes economies on your production line, that adds convenience as it wends its way through the channels of distribution, meanwhile combining that extra appeal of those aesthetic values that cause more of your product to be bought. The following are but a few of the R. T. G. case histories that have accomplished such a result.



Tru-Temp thermometers were packaged individually in unprinted cartons that served merely as a protective carrier. Hence, they were hidden from sight when on the retail shelf. Major sales being through small outlets, the demand was for only one dozen assortments of three different styles. R. T. G. suggested the use of a combination shipper and display unit. The ultimate design was built around the tradename "Tru-Temp' and dramatized the feeling of heat and cold. Effective copy, written by R. T. G.'s design staff, added further interest. Construction was such as to display all three styles with sufficient rigidity and extra protection for safe shipment of all the fragile glass involved. As "proof of the pudding", the display is now in its sixth year of use.

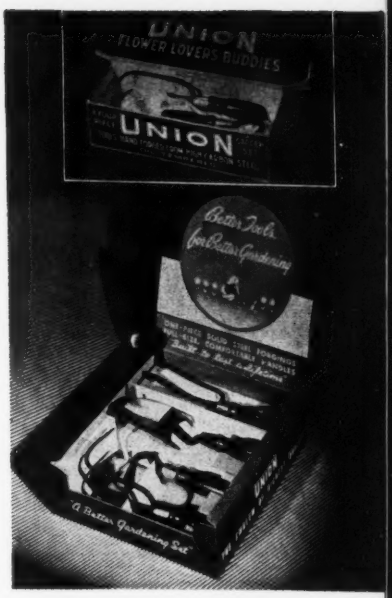


By creating a simplified unit, the R. T. G. design staff enabled Perfect Circle Company to greatly reduce its overall package costs. Former packaging materials were not only expensive, but the labor of filling, sorting, marking and re-ordering of some two hundred items was most complicated. R. T. G.'s ultimate package was a series of individual folders, grouped by sizes, made from greaseproof board. These fitted into an outer package, beautifully designed for each private brand. A special printed card for re-ordering was inserted between the open window of each carton unit. Display value was increased, handling was simplified all the way from manufacturer to retailer, and costs were radically reduced.

XUM

The illustration of "Before" package in the adjoining illustration shows how the "Union" trademark submerged sales copy on the display for garden tools. It shows how the sales value of the tools in the unit was lost because of wrapping in tissue paper and stacking the odd shaped tools one on top of the other.

The combination display and shipper individually displayed each tool, yet carried them safely without shifting or marring the container. By relegating the trademark to a minor position, space was made available to illustrate the products in use and to add sparkling sales copy. Sales within three months surpassed the total garden sets sold from the former display during the entire previous year.



At the time of R. T. G.'s contact with Spencer Wood Products, a terrific price war was being waged in the clothespin field. To offset this trend and to raise the entire standard of clothespin merchandising, R. T. G. created a new sales idea through the carton design. "Rainy Day" nursery ideas were developed, built around the character "Spence", the clothespin "Mortimer Snerd". Package inserts, that illustrated toys and games that could be made from clothespins, were developed and written as an extra service to the customer. Money prizes were offered for new ideas that could be added to future pamphlets. The complete program created by R. T. G. illustrates the extent of the overall design service available to its customers.



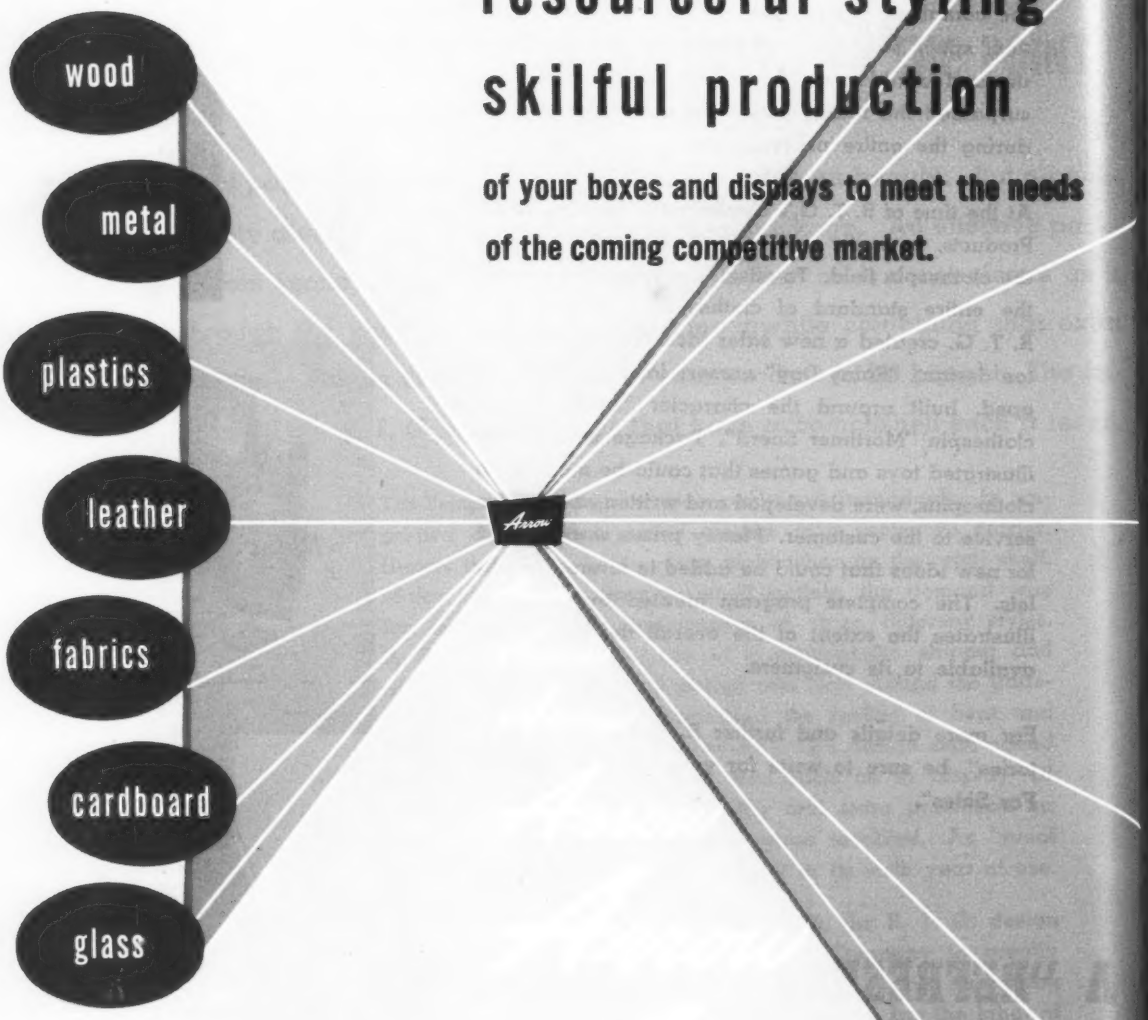
For more details and further R. T. G. "Case Histories", be sure to write for your copy of "Design For Sales".

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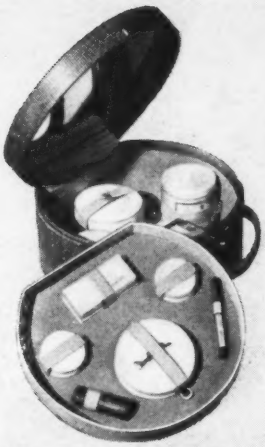
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4503 WEST MITCHELL AVENUE · CINCINNATI · OHIO



unique facilities
resourceful styling
skilful production

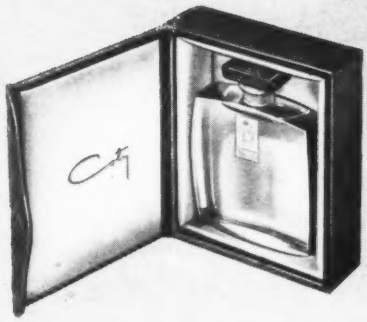
of your boxes and displays to meet the needs of the coming competitive market.

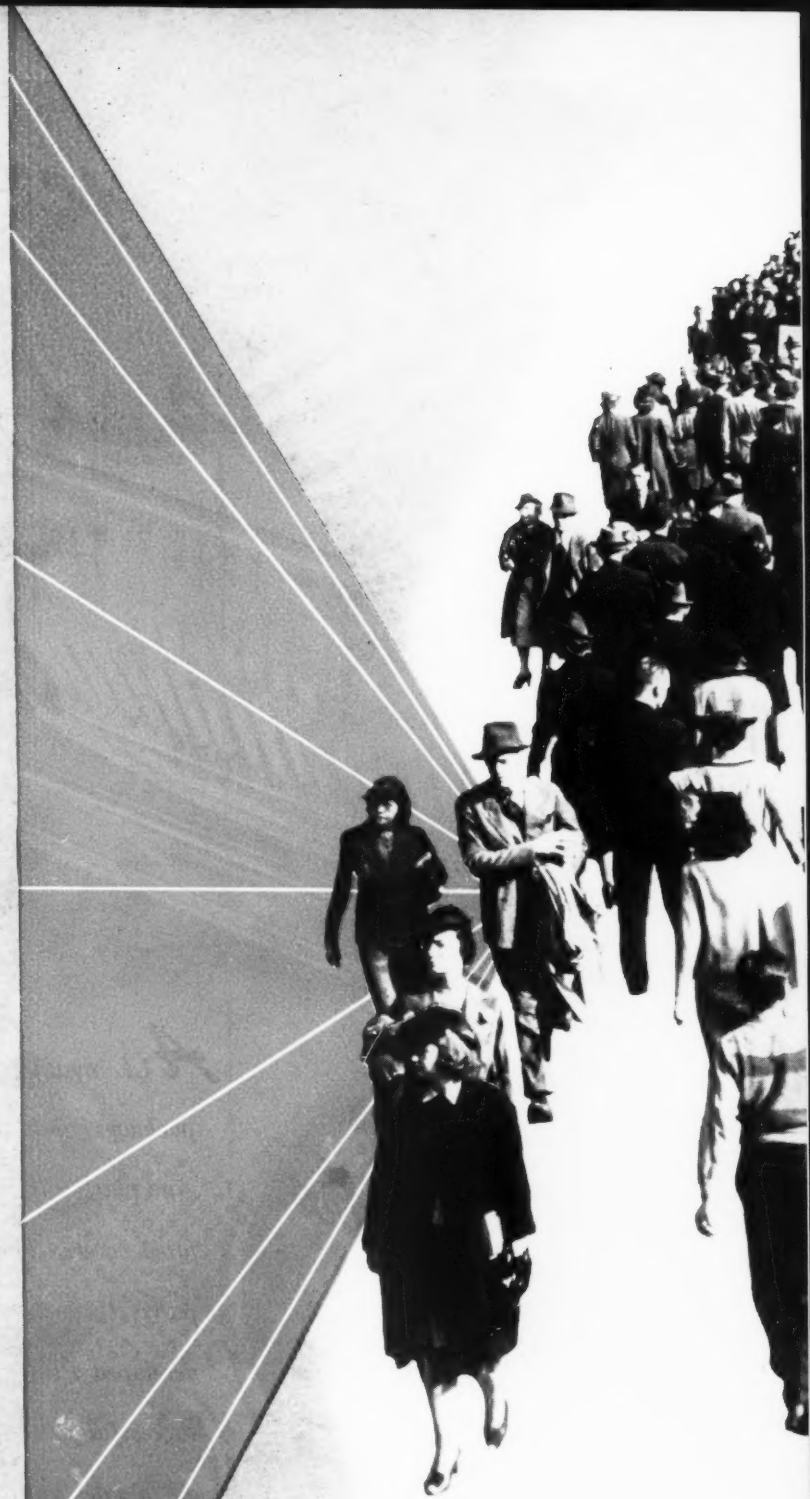
BOXES AND DISPLAYS











Arrow Manufacturing Company, Inc.,
Fifteenth and Hudson Streets, Hoboken, New Jersey

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Your Product...

FORM-FITTED IN

Plastics...!



All Shapes
All Protected
All Textures

ALL manner, shapes and textures of eye-attracting packages can be and are being produced by us in plastics. And plastics then sells the product right through the form-fitted covers. The National Transparent Plastics Company, through war-time research and experience, has developed Plastic Packaging so that it now can compete successfully in price with other types of boxes, yet exceeds all in sales appeal.

NATIONAL TRANSPARENT PLASTICS COMPANY

SPRINGFIELD 1 **MASSACHUSETTS**



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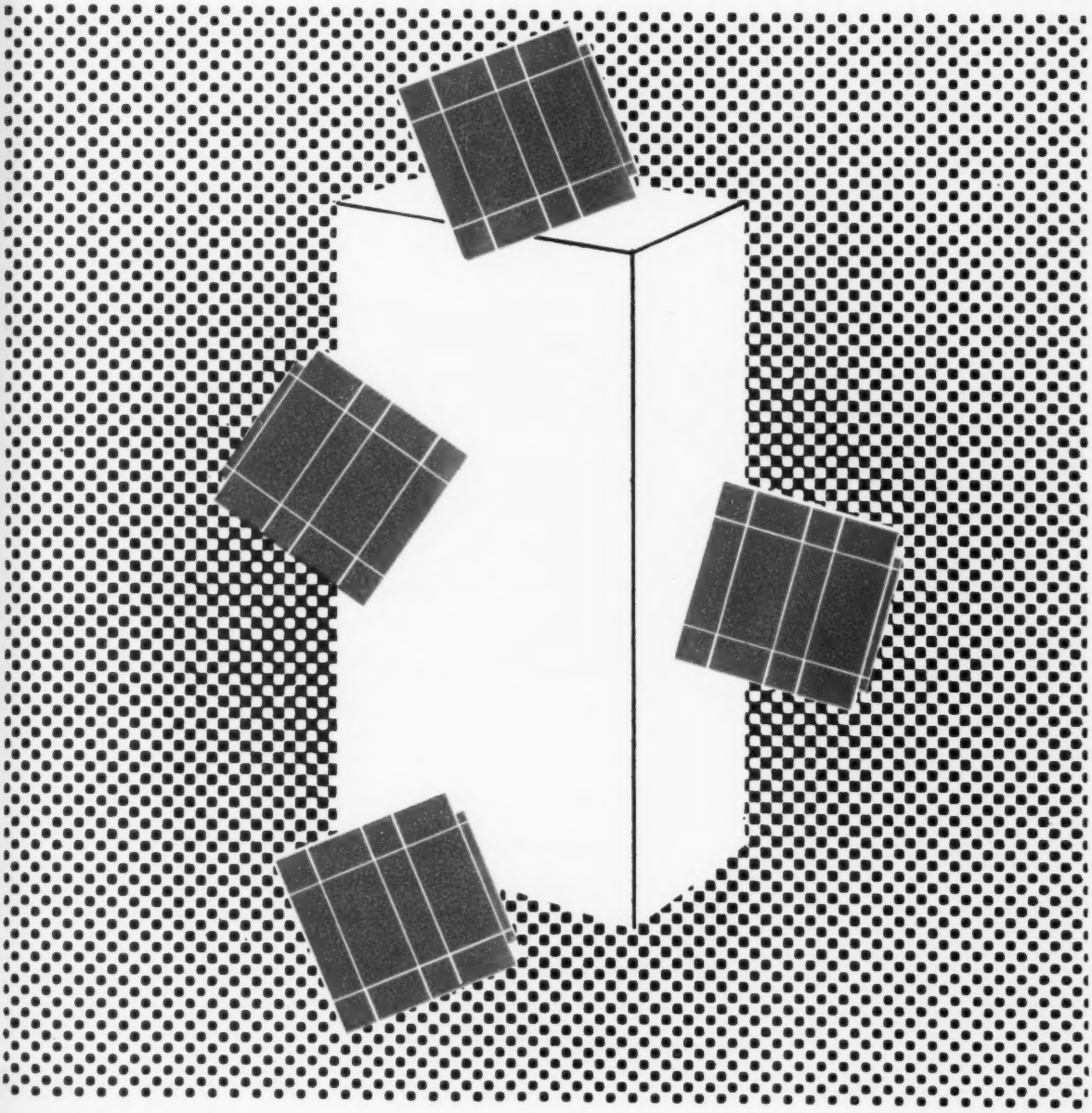
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ONE OF THE FINEST FOLDING BOXBOARDS

Ridgelo CLAY COATED BOXBOARDS

made at Ridgefield, N. J. by the Lowe Paper Co.


Rowell
"A big name in small boxes"
We are specialists in producing small set-up paper boxes for Pills, Tablets, Druggists' Prescriptions, Face Powder, Rouge and other cosmetics.
Special color printing is done on containers for face powder boxes, etc.
Rowell quality is guaranteed by fifty years of production success.
Many of packaging's big names rely on small Rowell boxes as an integral part of their sales and sampling operations.
Our specialization is further guarantee of economy and efficiency in producing your small box requirements.
E. N. Rowell Company, Inc.
Manufacturers of Fine Paper Boxes
Batavia, N. Y.


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91% OF U. S. INDUSTRY



In the packaging field Ohio Boxboard facilities cover the entire range of requirements — manufacturing the board, testing, developing, and converting. Complete coordination of cartons and containers for economy and merchandising appeal is a special advantage provided by **planned packaging.**

Geographically these benefits are available on an economical basis to areas as widely separated as New England and Texas. Over 91%* of U. S. industry is within profitable reach of **planned packaging** with headquarters at Rittman, Ohio.

We'll be glad to talk to you about your special packaging requirements.

*Based on 1940 census figures, value of manufactured products by states.

THE OHIO BOXBOARD CO.

RITTMAN, OHIO

Manufacturers of paper board, folding boxes, corrugated and fiber shipping containers, and converted specialties

SALES OFFICES: RITTMAN • AKRON • CLEVELAND • CINCINNATI • PITTSBURGH • NEW YORK • CHICAGO

Capacity 500 tons daily



PACKAGING PROBLEMS

CREATORS
DESIGNERS
MANUFACTURERS of

- Beverage Carriers
- Frame-Vue Display Boxes
- Folding Cartons
- Cracker Caddies
- Garment Boxes
- Millinery Boxes
- Paper Ice Cream Cans
- Counter Displays
- Merchandising Aids

MORRIS EXPERIENCE AND PRODUCTION FACILITIES *are at Your Command!*

Our packaging designers and craftsmen can develop and produce for you modern packaging of greatly improved utility and sales appeal . . . that will properly meet the protection needs of your product as well as your special merchandising requirements . . . that will solve all phases of your particular packaging problem.

MORRIS PAPER MILLS

135 SOUTH LA SALLE STREET, CHICAGO 3, ILLINOIS

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SHOWMANSHIP SHOWBOXES



A Showbox *protects* your product as only rigid, transparent plastic can do. ☆ A Showbox *attracts attention* because it provides complete visibility and the package actually enhances your product's eye appeal. ☆ Best of all, Showboxes, because they are volume produced, give you luxury packaging which is functional and beautiful at comparatively low cost.

DIVISION OF

CENTRAL STATES PAPER and BAG CO., Inc.

2600 N. Broadway, St. Louis 6, Missouri, U. S. A.

Chicago 520 N. Michigan Ave. | New York 489 Fifth Ave. | Detroit 1951 E. Ferry St.


TOPS in All-America
and TOPS in SALES APPEAL
..learn how you can get finer
Jewelry and Novelty
Boxes of Distinction
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Watch Boxes
Transparent Boxes
Ring Boxes
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Plastic Boxes
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Plastic Jewelry Boxes
Exclusive Boxes Designed to
Fit Individual Requirements
Universal Jewelry Case Co.
CHICOPEE, MASSACHUSETTS
NEW YORK • PHILADELPHIA • PROVIDENCE • CHICAGO • LOS ANGELES • NEW ORLEANS

4 Star Salesmen

FOR YOUR PRODUCT



VUE-PAC

Window carton with greaseproof, moistureproof liners for the food industry.

FLASH-PAC

Folding carton, knocked down, but ready for set-up in a simple operation.

STURDI-PAC

Strong set-up boxes for many types of products.

SHU-PAC

Economical folding cartons for shoes.

All Gordon cartons are designed and manufactured with one thought in mind—to do a better selling job for you.

If your product has "eye appeal" or merely needs packaging protection before reaching the market, our organization is equipped to supply the proper container—promptly!

Sketches, designs and samples will be gladly submitted without obligation.



GORDON *Cartons, Inc.*

EXECUTIVE OFFICES AND FOLDING BOX DIVISION
1619-29 WARNER STREET, BALTIMORE 30, MARYLAND

Formerly GORDON-LAVIN PAPER BOX CO., INC. *"Serving Since 1900"*

CREATIVE MANUFACTURERS OF MODERN PAPER PACKAGES

Set-Up Box Division—118-20 North Paca Street, Baltimore 1, Maryland. Norfolk-Portsmouth Division—Ninth Avenue and High Street, Portsmouth, Virginia. Affiliated Company—Pennsylvania Paper Box Co., Inc., Littlestown, Pennsylvania.

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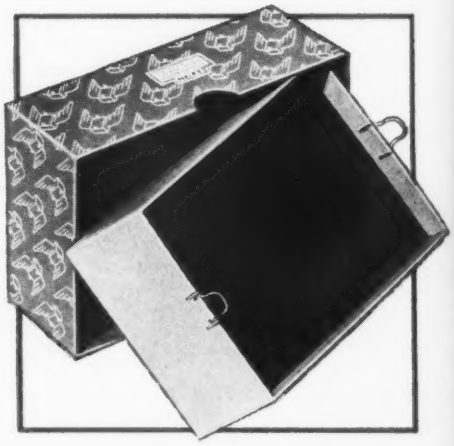


America's number one package . . .

ON LAND: For small parts packaging, the Mason MailMaster is the leading container for speedy, convenient, strong packaging.

AT SEA: For export packaging, the Mason MailMaster, because of its light weight, basic strength and patented closure, is America's number one export package — ably demonstrated by the millions which have been used during the war for packaging vital overseas supplies.

IN THE AIR: Seventeen years ago the Mason MailMaster was, as it is today, the number one air mail package. Pioneered for light weight and maximum strength, the Mason MailMaster leads the field in air transportation packaging. Write for new catalog showing the entire line of Mason MailMasters, Dept. (16), The Mason Box Company, Attleboro Falls, Mass., 175 Fifth Ave., New York.



The NEW Mason MailMaster designed for the Age of Flight. Light and strong, with positive wire closure.

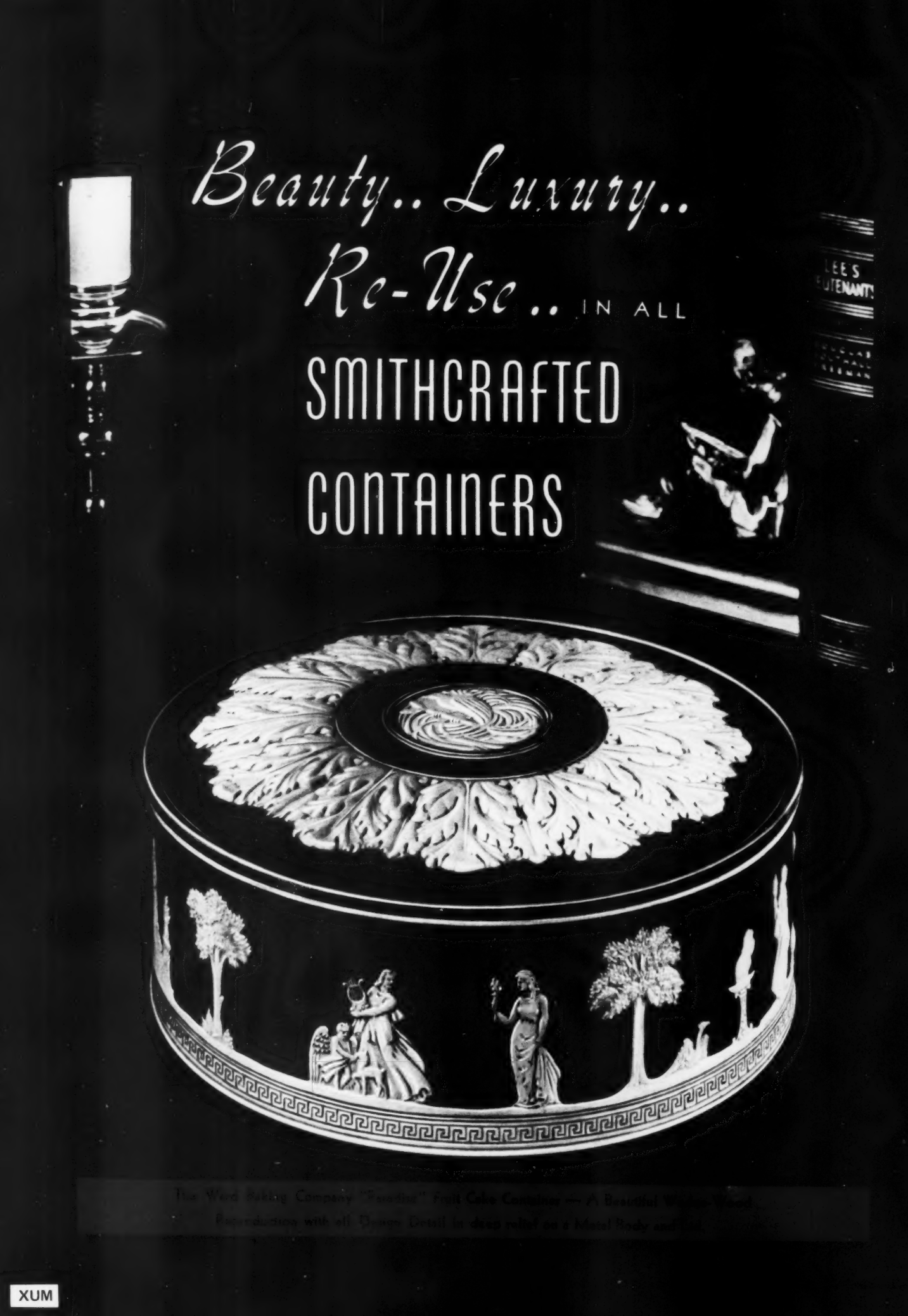
The MASON BOX COMPANY

MANUFACTURERS OF AMERICA'S NUMBER ONE BOX . . . THE MASON MAILMASTER

Age of
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Beauty.. Luxury..
Re-Use.. IN ALL
SMITHCRAFTED
CONTAINERS

SMITHCRAFTED CONTAINERS

They are substantially fabricated of fibre board, wood, or metal frames with applied designs employing the newer leatherette base materials, ingeniously SMITHCRAFTED to simulate not only rich leather,—but numberless other "quality" and "prestige" effects,—such as fine fabrics with applique designs, carved ivory and cinnabar, worked-metal, and even molded plastic-like reproductions.

SMITHCRAFTED containers are all custom-built to most effectively fit each individual product. The process is extremely flexible, with little restriction on sizes, shapes, colors and designs, without excessive mold or die costs. Practical production in small as well as large quantities, from 1000 to 100,000 or more—WITHIN REASONABLE MERCHANDISING PRICE LIMITATIONS.

If you want a gift package that sets your product "apart from and above" others—that "talks" quality—that enhances "gift-value"—in short a package that will put you into,—or give you a greater share of the gift market—then by all means investigate SMITHCRAFTED containers for your next gift package.

THE S. K. SMITH COMPANY

2857 N. WESTERN AVE. CHICAGO, ILL.

New York Office, 52 Vanderbilt Ave., MUrray Hill 9-8290

SMITH CRAFTED CHICAGO



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Designers & Manufacturers
of

FOLDING BOXES
DISPLAY CARDS

Printing on foil our specialty

Our Art and Sample Department at Your Service

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The COMPLETE Service for FINE WOODEN CHESTS, DISPLAYS

"From Standing Timber to Finished Product"



TIMBER •

The finest grained woods are the raw material of ROCK fine wooden chests and display cases. This is the first reason for the premier quality of the finished product.

DESIGN •

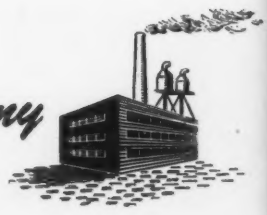
Our designers are artists in wood. Their designs are fashioned and expertly tailored to bring out the best that our fine woods can offer.

PRODUCTION •

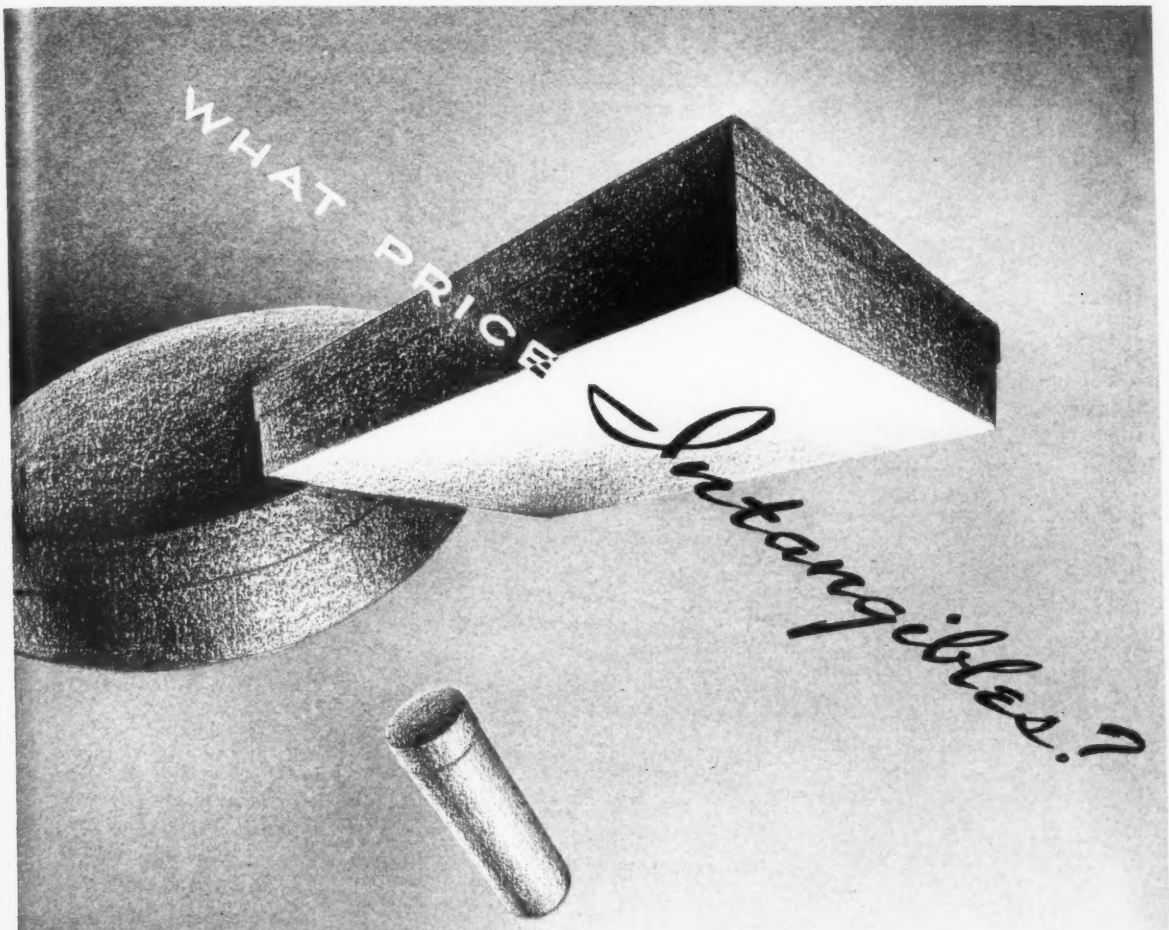
There is no substitute for knowledge and experience in the production of fine wooden pieces. Our craftsmen have the background and the know-how to turn out quality packages and displays. The best test is the fact that ROCK displays and chests are used by leading manufacturers to sell and protect their finest merchandise.

ROCK *Manufacturing Company*

STOUGHTON, MASSACHUSETTS







Pick up a Cambridge container.

Can you **see** the ingenuity and mindpower that conceived this specific package for a specific use? Can you **feel** the long years of research, the concentrated effort, which went into making a container with so many distinct advantages?

No — for these are intangibles . . . imperceptible to sight or touch. But these are also the vitally important factors — the **plus** factors — that distinguish each Cambridge container. And because of the plus factors, every package we develop for you is not merely a box, but an integral part of your product.

Depend on Cambridge for containers of **tangible** quality, beauty and strength . . . as well as the **intangibles** that make them outstandingly successful.

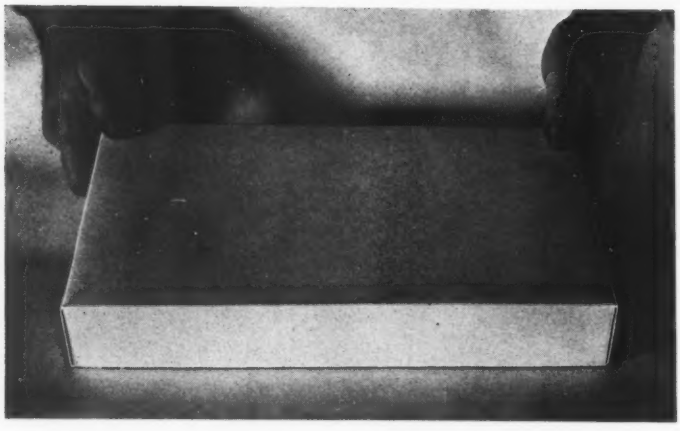
CAMBRIDGE
Containers

CAMBRIDGE PAPER BOX CO., CAMBRIDGE, MASSACHUSETTS
BOXES • CANS • TRANSPARENT CONTAINERS • LABELS AND ALLIED PRODUCTS

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VICTORY IS OURS...
POST-WAR PRODUCTION IS HERE

Many of our customers have designed new products and will package the items in Simplex boxes as an effective packaging unit which promotes retail buying decisions.

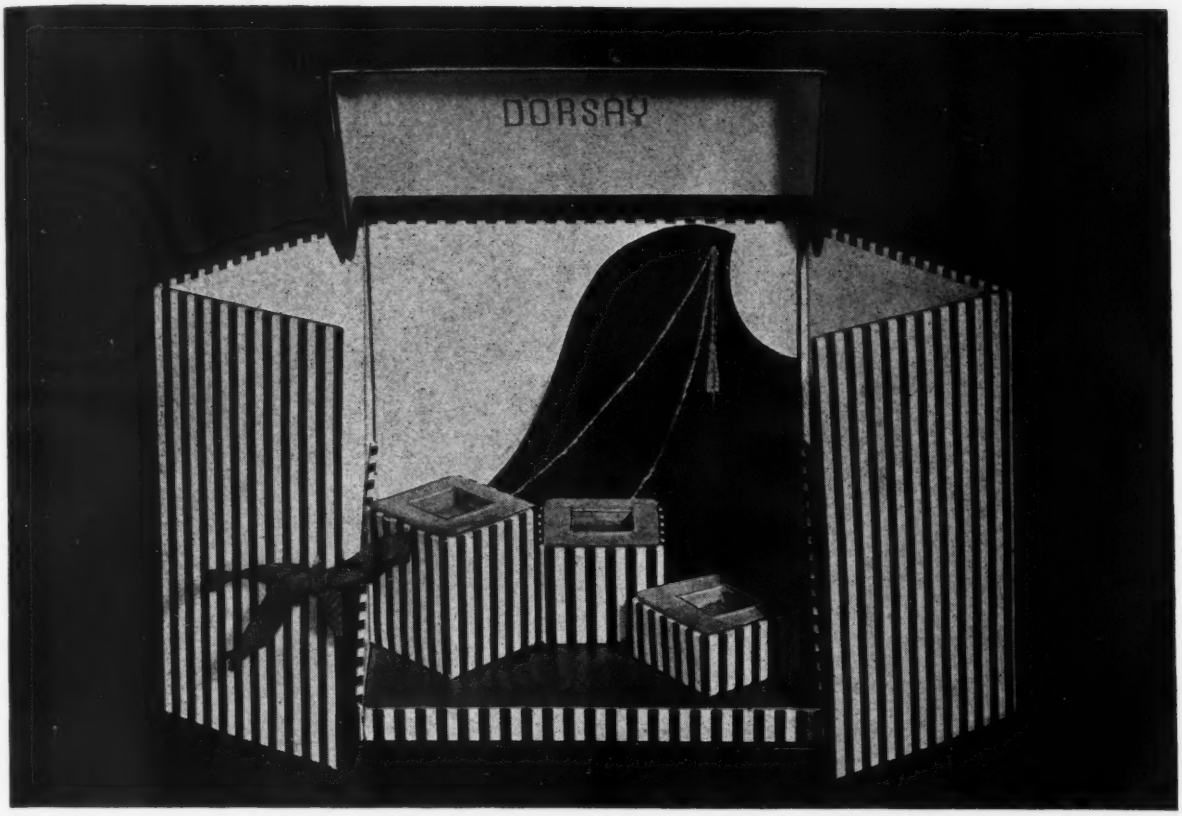


- *Simplex box customers are like a "Who's Who."*
- *In business—our customers are well known companies.*
- *As distributors—their items are nationally recognized.*

WE CAN ASSIST YOU IN GETTING AN IMPROVED FOLDING BOX

SIMPLEX PAPER BOX CORPORATION
LANCASTER PENNSYLVANIA

SIMPLEX
TRADE MARK REG. U.S. PAT. OFF



Fancy SET-UP BOXES

of Paper, Velvets and Other Materials

Originators—Producers of the finest set-up boxes to package quality perfumes, cosmetics and jewelry. We serve manufacturers, department stores, wholesalers and retailers.

OSCAR TRILSCH COMPANY

150-25 18th AVENUE, WHITESTONE, L. I.



PETERSON BROTHERS

165 NORTH ELIZABETH STREET • CHICAGO 7, ILLINOIS

Fancy Wooden Boxes



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MILLER SET-UP PAPER BOXES

Designed to count at the

Point of Use

Their attractiveness encourages purchases

Point of Sale

They deliver the product ready for use . . . with quality and efficiency unimpaired.

and designed for specific economies

In Filling

They save time . . . speed the whole operation

In Storage and In Shipping

They stack economically . . . protect contents

WALTER P. MILLER COMPANY, Inc. *Paper Boxes*

452 YORK AVENUE • PHILADELPHIA 23 • PENNSYLVANIA

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Creative designing and restyling
Exclusively handmade boxes

by

MAKDON

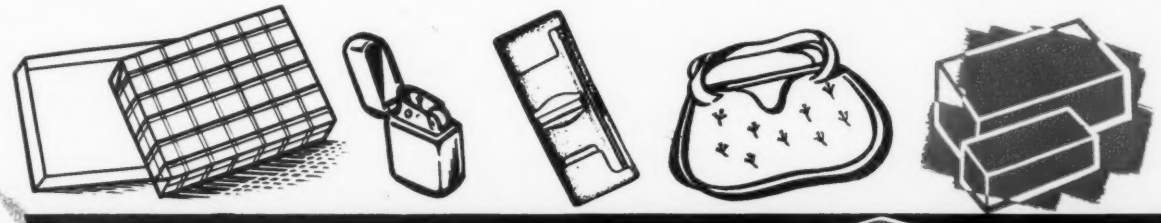
in New York City

306 WEST 37th STREET • SINCE 1940

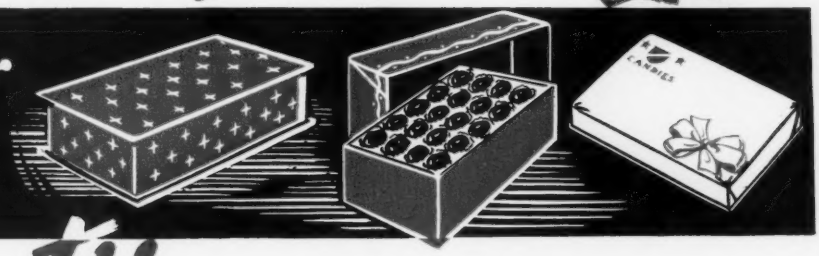
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STE ANONYME JACQUES MAKOWSKY
ATELIERS D'IMPRESSION ET DE CARTONNAGE D'ART
34 RUE DES PEUPLIERS • SINCE 1920

Boxes for all Purposes



Candy etc.



Beauty *in* GOLD LEAF STAMPING



Russell McPhail
CHOCOLATES



There is no more beautiful packaging aid than gold stamped labels, seals, or wraps made with your own designs or trade marks.

Mutual craftsmanship has long been a by-word in the packaging field. Put this proved sales force to work for your products.

MUTUAL PAPER BOX CORPORATION

Manufacturers BPC *of Paper Boxes*

1500-2-4 WEST HARRISON STREET **CHICAGO** TELEPHONES MONROE 6465-6466

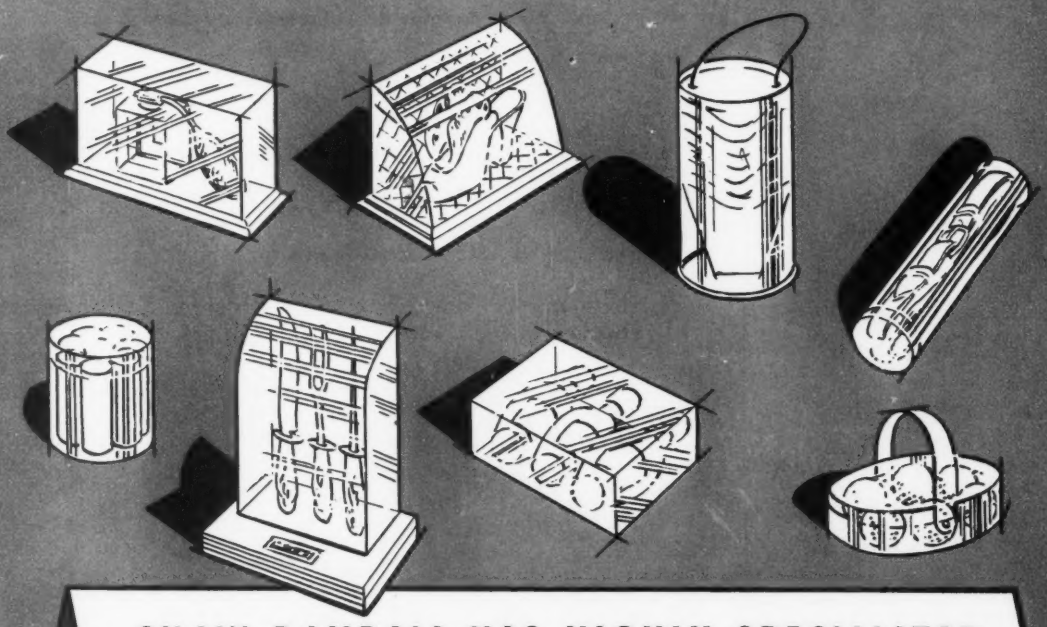
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TO BE SEEN
IS
TO BE SOLD!

Put your product in visible, transparent Shaw-Randall packages . . . packages that tell the customer, "You'd better look into this."

Shaw-Randall's experience in creating and fabricating acetate containers of many kinds is at YOUR product's service. Shaw-Randall packages win prizes from the judges . . . win loyal acceptance from the public.

Let us submit ideas in acetate for your product.



SHAW-RANDALL HAS HIGHLY SPECIALIZED FACILITIES FOR CREATING and PRODUCING

ACETATE PACKAGES ★ LEAD FOIL POUCHES

DIE-CUT CONTAINERS

ALSO DIE CUTTING AND ASSEMBLY

of all types of paper products including newsboard and special laminated papers.

SHAW-RANDALL CO.

A DIVISION OF THE SHAW PAPER BOX COMPANY · PAWTUCKET · R · I ·

NEW YORK SALES REPRESENTATIVE — FRED MANN & CO., 545 FIFTH AVENUE

BOSTON SALES AGENCY — H. B. W. SNELLING, 53 STATE STREET

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Check List

TO FILL YOUR BOARD AND PAPER NEEDS

Our New York City plant and warehouse occupies 55,000 sq. ft. in a very accessible location. We are ready to serve you from this new address with increased efficiency

NEW YORK CITY PLANT

This entire building is devoted to stocking your board and paper requirements.

- ○ Wrapping Tissues—Grades #1, #1 1/2, #2, #3
- ○ Set-Up and Folding Box Boards
- ○ Thermoplastic Board for Molding into 3-Dimensional Displays and Objects.
- ○ Mounting Board for Window Displays
- ○ Paper Specialties for the Leather Goods Trade
- ○ Wrapping Papers
- ○ Cotton Wadding
- ○ Sheet Lining—we supply board, fancy and plain papers—or work with your stock.
- ○ Book-binding papers
- ○ Binders Board
- ○ Twines

JAYPACO

JOE SALWEN

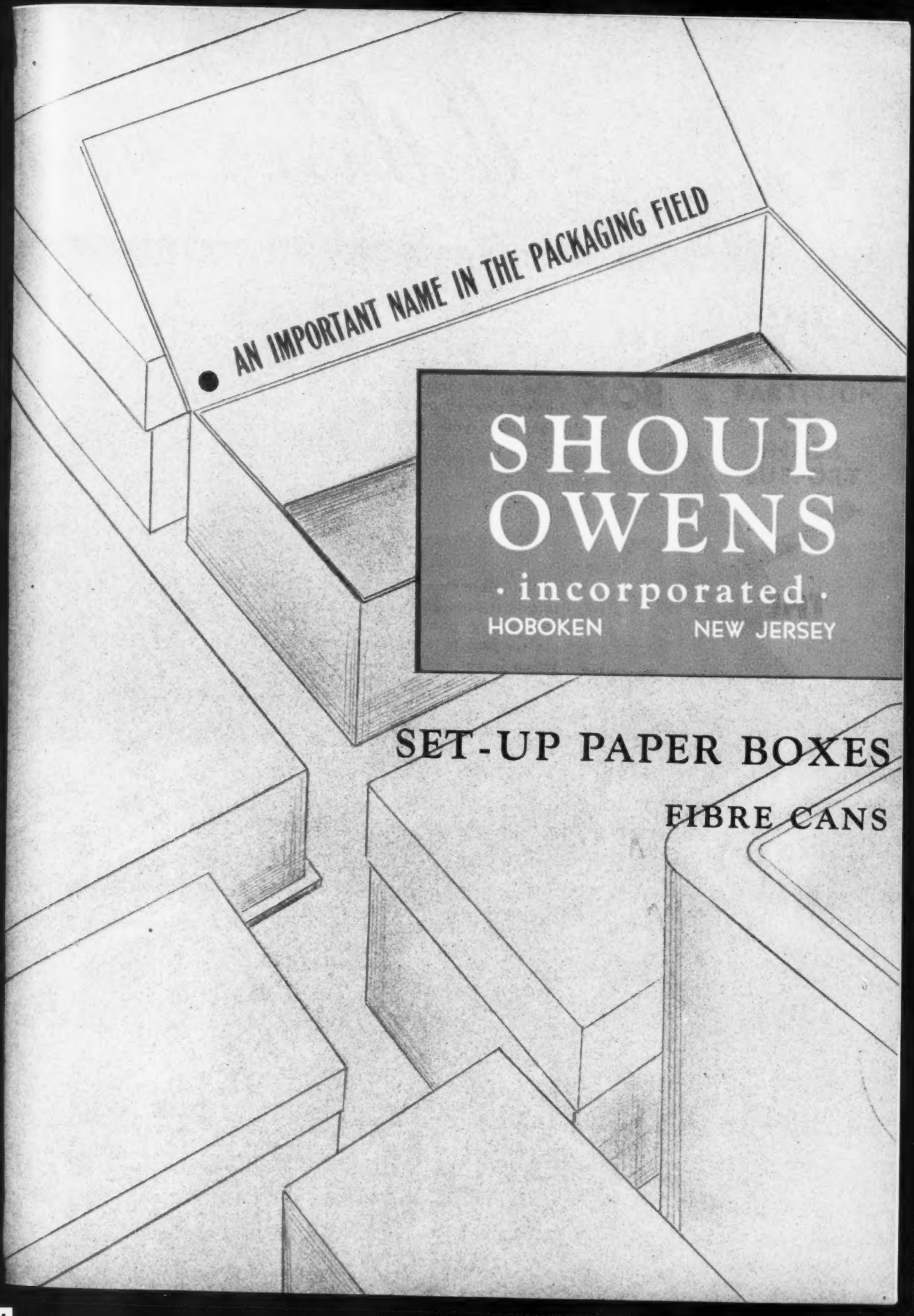
PAPER PRODUCTS CORP.

245 West 67th Street New York 23, N. Y

TRafalgar 4-6640






AN IMPORTANT NAME IN THE PACKAGING FIELD
SHOUP
OWENS
· incorporated ·
HOBOKEN NEW JERSEY
SET-UP PAPER BOXES
FIBRE CANS

All this . . . and

THE *Set-up* **BOX**

Whatever your product, whether it's as gossamer as a dream, as perishable as an idea, or as strong as steel, the set-up box offers you packaging advantages that no other container can approach. Its rugged construction, strength without added weight, makes it the safest container on the market and assures you perfect product protection. Custom built, it guards and glamorizes your product.

THE *Set-up* **BOX**

More than that, it provides one of the most potent sales messages you could desire . . . a sales stimulant wherever it goes, from your factory to the dealer's shelves and to the home consumer. Over nine billion set-up boxes will be sold in 1946. They are versatile . . . safeguarding, shipping, selling and storing your product, and they have added take-home qualities too.

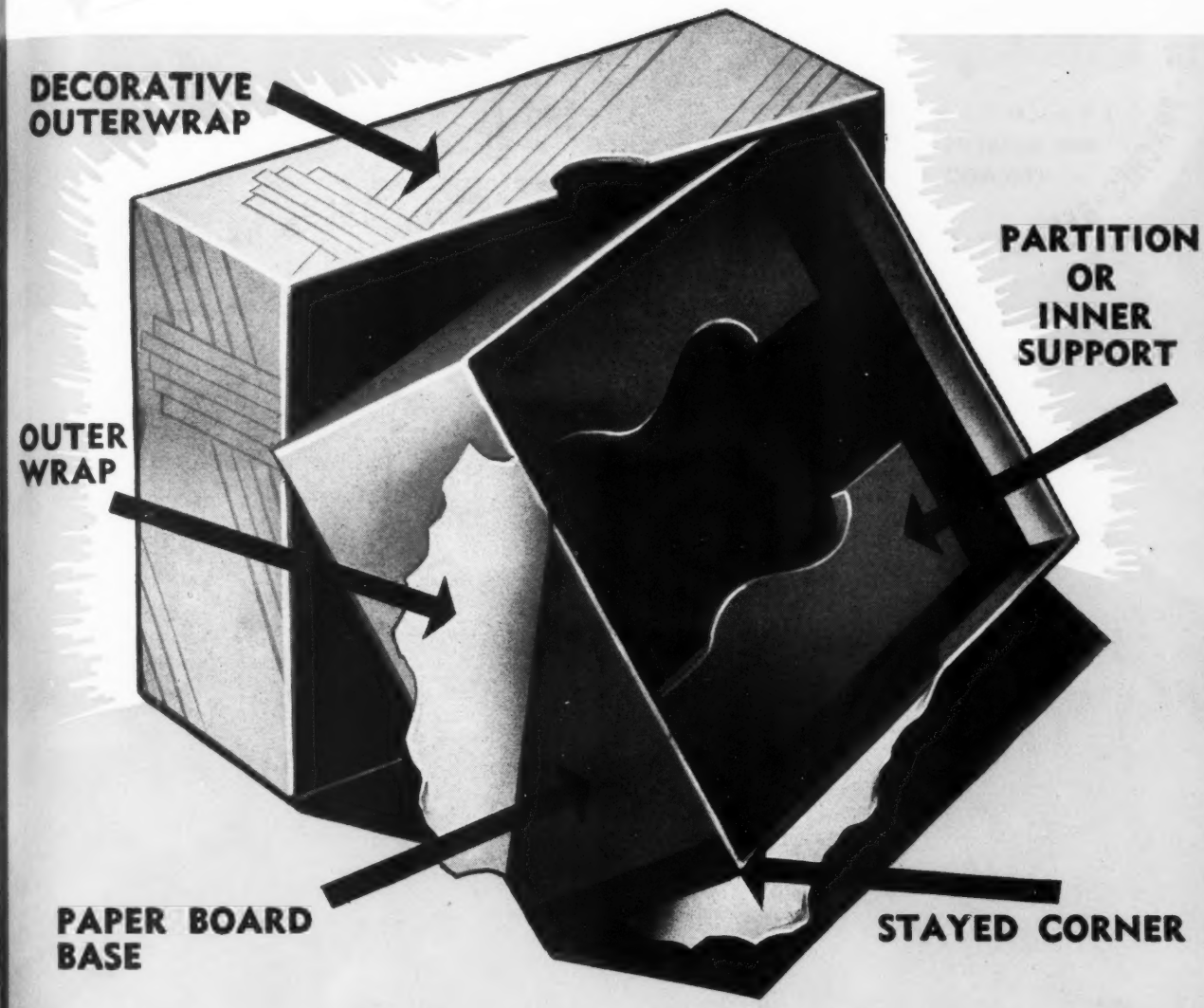
THE *Set-up* **BOX**

If it's style, sales appeal, product identification, protection, shipping speed, and economy you want, these custom-built containers offer it. Over 21 major industries have reported that this is their favorite container. Check on its custom-built features with your nearest set-up box manufacturer. He will gladly give you full information on these sales conscious packages.

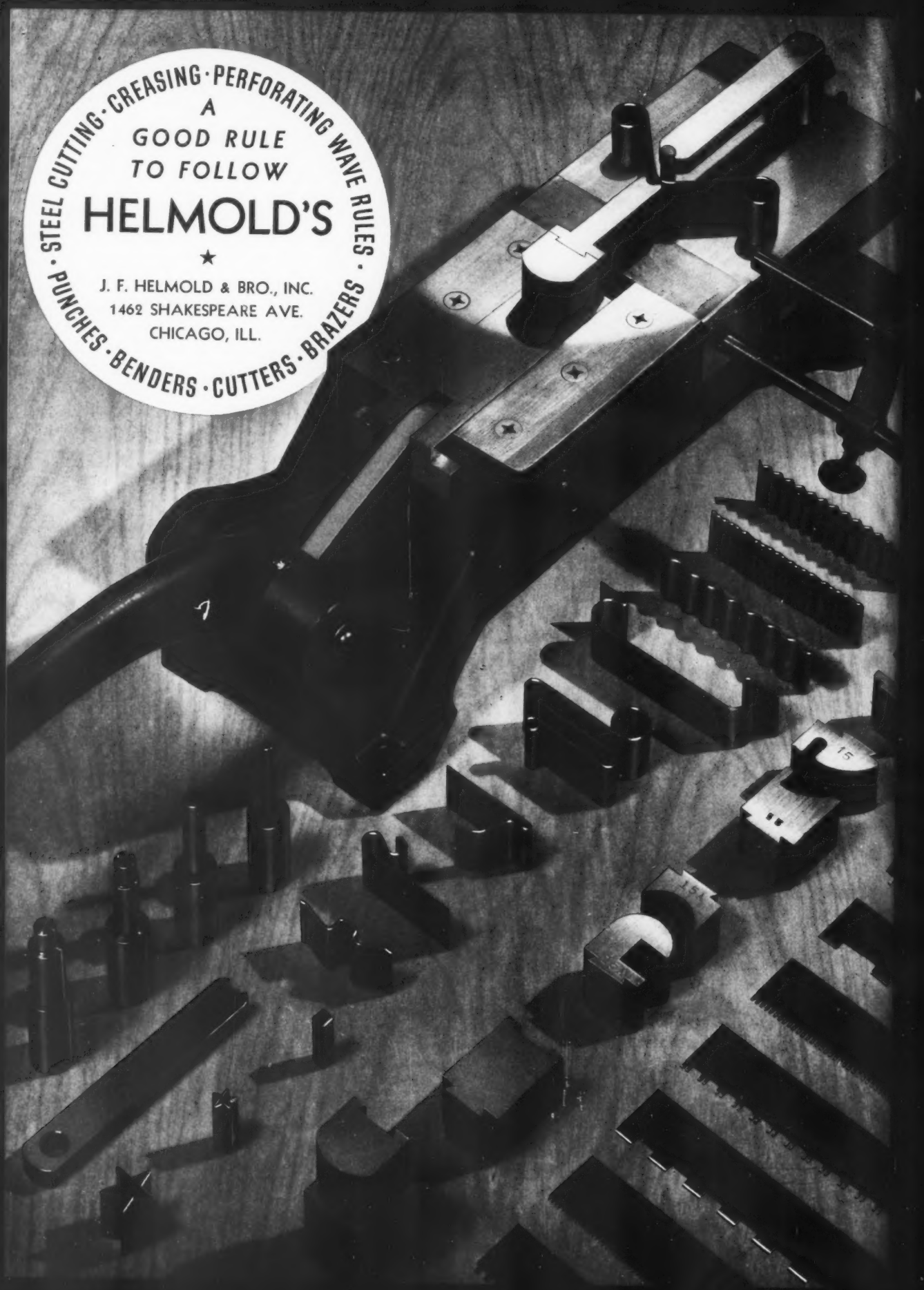
The Association has recently completed the following industry-wide surveys which may be of help to you: Boot, Shoe and Slipper Industry, Confectionery Industry, Department Stores and Retailers, Electrical, Radar and Radio Equipment Industry. Food Industry, Hardware, Small Tools and Machine Parts, Health Equipment and Supplies Industry, Hosiery Industry, Drug and Chemical Industries, Household Specialties Industry, Jewelry and Silverware, Leather Goods and Novelties, Office and School Supplies Industry, Plants, Seeds and Nursery Stock Industry, Shirt, Tie, Collar and Muffler Industry, Soap and Cosmetics Industry, Stationery and Greeting Card Industry, Sweaters and Knitted Goods Industry, Textile Industry, Tobacco Industry, Toys, Games and Novelties Industries. Ask your nearest set-up box manufacturer for copies of these surveys (no. 34), which are of interest.

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d more too!

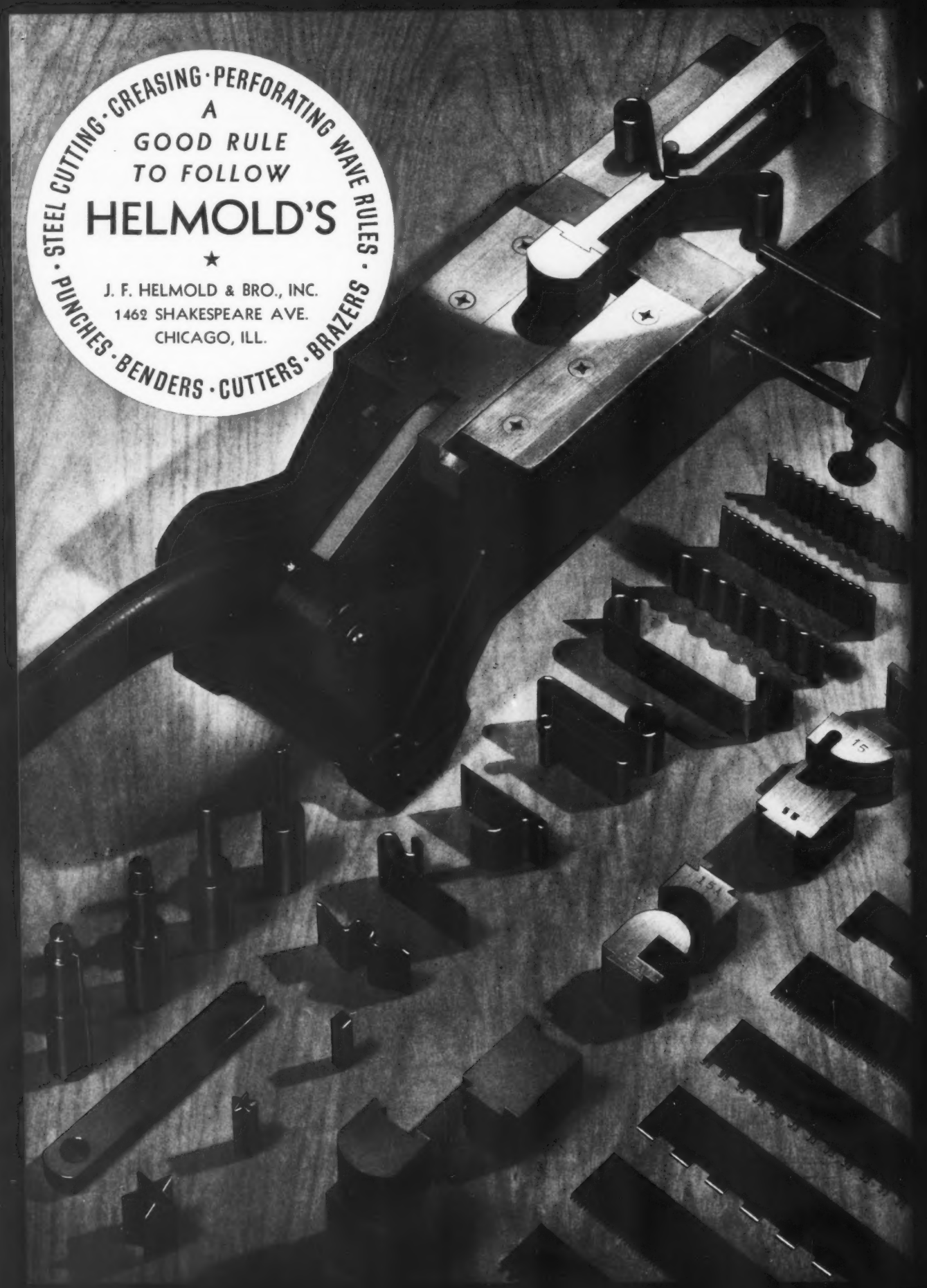


NATIONAL PAPER BOX MANUFACTURERS
Association
AND CO-OPERATING SUPPLIERS


STEEL CUTTING · CREASING · PERFORATING WAVE RULES ·
A
GOOD RULE
TO FOLLOW
HELMOLD'S
★
J. F. HELMOLD & BRO., INC.
1462 SHAKESPEARE AVE.
CHICAGO, ILL.
· PUNCHES · BENDERS · CUTTERS · BRAZERS ·

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STEEL CUTTING · CREASING · PERFORATING WAVE RULES ·
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PLANNED FOR... *Consumer appeal...*

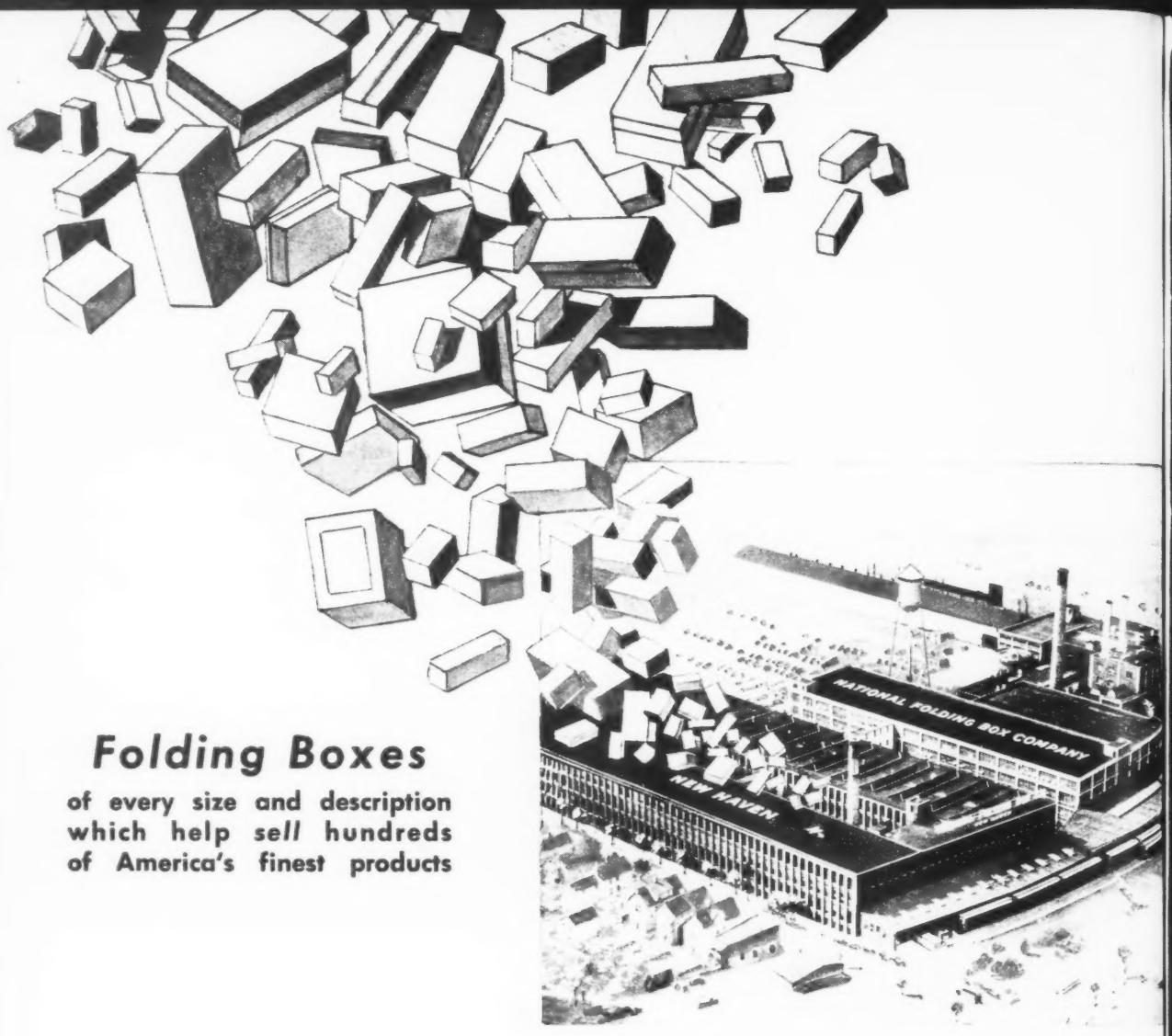


Every Berles carton has that extra something *built in*—that extra appeal that invites consumer dollars to buy. That is because Berles' cartons are planned with consumer preferences in mind. Berles' cartons are standouts on shelves or counters, in window displays and in supermarket groupings. They spell *quality*—but they are made at a *price*. We will be glad to show you samples and to help you design your cartons. And to produce them, of course.

86 FIFTH AVENUE, PATERSON, NEW JERSEY

New York: CHickering 4-3983 **Paterson: SHerwood 2-6430**

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Folding Boxes

of every size and description which help *sell* hundreds of America's finest products

Sales executives facing the certain problems which lie ahead in the post-war merchandising battles just ahead can only be certain of doing business on a profitable basis if their products are sent to market in packages deliberately designed to appeal to potential consumers, the kind which make it easy for them to *buy those products on sight.*



"Packaged by National" is far more than a trade slogan, for behind it stands over 50 years of continuous and specialized experience in package research, design and production backed with every facility to do a complete job from original planning to finished package. If your packages don't have definite "sales appeal" this is a good time to invite a National package engineer to come in and advise with you.

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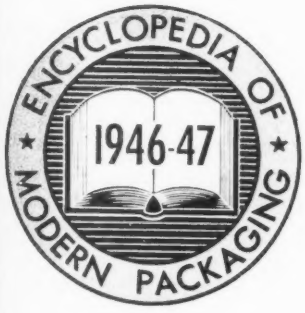


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BAGS—ENVELOPES—PACKETS

Paper Bags 240
Specialty Flexible Containers 243
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Page 239

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Paper bags

The paper bag was used before the Civil War as a convenient and economical method for carrying items from store to home. Today, it takes its rightful place among glass jars, tin cans and cardboard cartons as a standard packaging medium that protects the product from the time the bag is sealed at the factory until it reaches the home of the consumer.

Some of the reasons for the increasing importance of the paper bag in packaging are:

1. Automatic packaging machinery for the filling and sealing of paper bags
2. Methods of heat-sealing providing a tighter seal
3. Improved protective papers available for their manufacture
4. Coatings that add protection and efficiency
5. Improved design and printing methods that increase shelf appeal

The war scarcity of tin, burlap, foil and other packaging materials brought about the use of paper bags for a large number of products formerly packaged in other types of container. Military shipments included bags of almost every type from small envelopes for lemon drinks to heavy-duty bags carrying 100 lb. or more of chemicals or foods. Bags-in-cartons made possible conversions from metal packaging to paper.

At first thought, "bag" ordinarily connotes the brown paper bag which is used by every corner grocer, but this does not properly fall into the formal classification of paper-bag packaging. Better examples of the latter are the bags used for coffee, flour, sugar, etc.

Paper bag packaging is today usually classified as "flexible packaging" (see p. 628). It comprises those paper bags which are filled and sealed in quantity before they reach the point of retail sale. The filling and sealing may be done at the factory, refinery or roasting plant, or by the grower, receiver or wholesaler. When the paper packages reach the retail outlet, they are stored, displayed and sold as complete units.

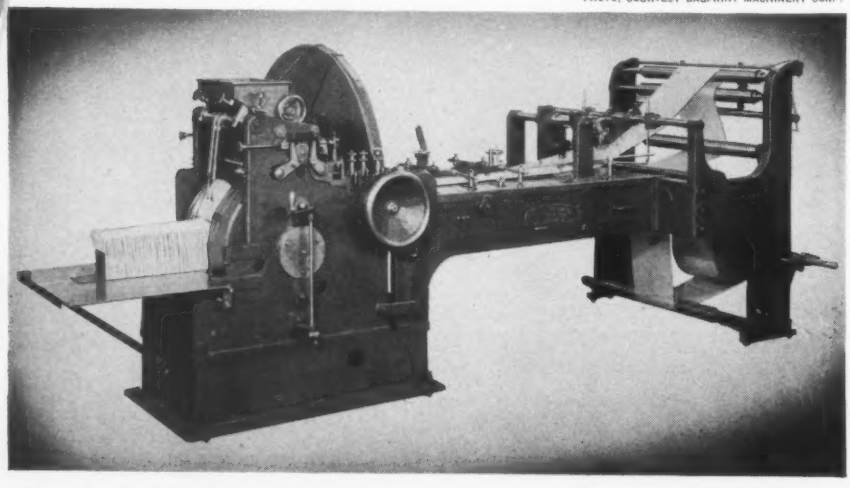
The diagrams (Figs. 2 to 5) illustrate the four basic types of paper bag. Most paper bags are made in these constructions. Variations usually are classified under such terms as sacks, packets, pouches, envelopes, depending on geographic colloquialisms and terminology used by the manufacturers. There is no established nomenclature beyond these four basic constructions.

A variety of papers is available for bags according to the requirements of the product to be packaged. Kraft papers are used for strength, with a double thickness of kraft paper where added protection is required; e.g., the double-walled kraft bag for packaging of sugar at the factory. The second thickness of paper assures added protection against outside moisture, dust, dirt and other contaminating matter, and also enables the package to withstand handling in shipping, storing and delivery.

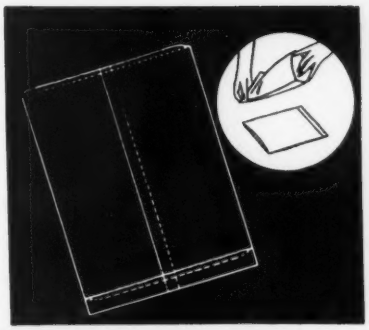
Where the product contains oils which would seep through paper, an inner protective liner of glassine is often used. For example, the liner is used for coffee to prevent product oils from coming through the outside paper, and it is used for salted nuts for the same purpose. Waxed paper liners are used to prevent moisture from finding its way in or out of the package.

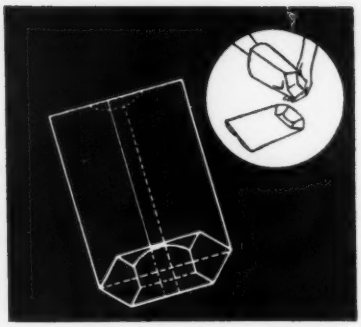
Where especially greasy products are to be packaged, a parchment paper is often used. Lard is packaged in such a bag; so is sausage meat. Many other combinations of paper are available to meet particular conditions. A study of the conditions of packing, storage, shipping and handling will determine the paper or combinations of paper to be used. Laminated combinations provide protective barriers to meet the requirements of practically any product that can be dis-

PHOTO, COURTESY BAGPRINT MACHINERY CORP.

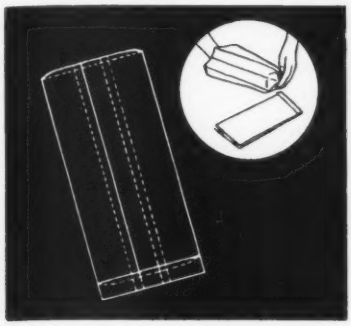


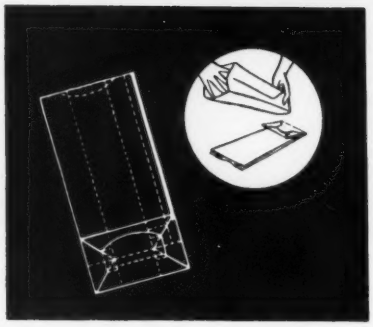
1—The high-speed bagmaking machine shown here will produce specialty bags ranging in size from 2 in. to 10 in. in width and 3½ in. to 17 in. in length





2—(Left) Flat bags were the first type developed, are the simplest in construction and the cheapest to make. They have a lengthwise seam, the bottom is folded under and pasted. 3—(Right) The satchel-bottom bag provides a flat base; filled, it makes a roomy, neat package.





4—(Left) Square bags have folded bottoms; bellows folds at the sides reduce width of closed bag without reducing capacity. 5—(Right) Automatic self-opening bags combine the desirable features of other types. Filled, they make neat, square packages with stable bases.

tributed in any one of these various types of bag.

Large multiwall bags are used as shipping containers for a list of more than 300 products including such items as coffee, sugar, rice, chemicals, synthetic rubber and calcium chloride. Each of the plies used in the construction of such bags has its particular protective function, selected by exhaustive tests for suitability.

Use of the multiwall bag as a shipping container for smaller consumer bag-packaged units of coffee or sugar was adopted during the war. In the case of sugar, 60 lb. are packed in units of twelve 5-lb. packages, six 10-lb. packages or thirty 2-lb. packages. Shipping containers for coffee hold twenty-four 1-lb. bags.

Paper bags are widely used as packaging material in retail establishments, where individual purchases are placed in the bags so they can be carried home conveniently. Usually the only closure is formed by folding over the top of the bag. Some of the familiar forms used in this manner are:

1. Grocery bags (to carry supplies)
2. Paper sacks (used in the super markets)
3. Notion bags (for small, flat objects)
4. Millinery bags (same shape, larger size, for hats)
5. Garment bags (used by dry cleaners)
6. Liquor bottle bags (long and narrow to fit bottles)
7. Candy bags (used in every candy store)
8. Bread bags (just fit a loaf of bread)
9. Window bags (with a transparent window)
10. Shopping bags (large, of heavy kraft, with satchel-bottom and twisted paper handles, for carrying)
11. Beverage bags (short, automatic, with twisted paper handles, for bottles of soft drinks)
12. Bru bags (automatic, heavy, moisture-repellent kraft for products taken from refrigerators)
13. Nail bags (automatic, heavy kraft, shorter than grocery bags, used for nails in bulk and other hardware)

So many types of bag may be manufactured on special order that it is impossible to include a listing of all of them. A few examples, however, will give an idea of their wide application.

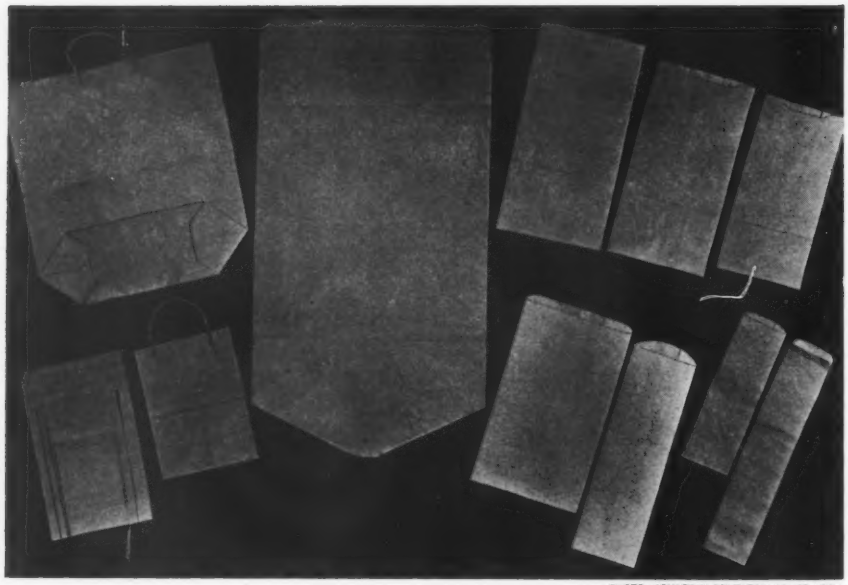
Tarnish protection—Antitarnish papers of many kinds (i.e., papers formulated to be free of sulfur) are made into flat bags of many sizes to provide protection for individual tarnishable items and are used extensively for packing silverware. This development is a progressive step over the former use of these materials as wrappings. The use of antitarnish bags provides a neater and more lasting protection and is therefore desirable because it makes many products more readily identifiable and salable.

Cotton-lined bag—To protect delicate surfaces of mirrors, china and glass, and to protect silverware from tarnish, excellent cotton-lined bags have been made. The cotton is first bonded to paper and the completed padded sheeting is then worked into bags, usually sewn.

Automatic bag with transparent panel—To provide appeal of visibility for a variety of products, automatic bags are made with a panel of cellophane along the entire length of the bag.

Oversize and odd shapes—For unusual shapes—a long narrow bag for an umbrella, a huge cellophane bag in which to display a grand piano or an automobile—certain companies are equipped to fill the order.

Sample mailing bag—Many small bags of various materials are now being made as direct mail pieces for



PHOTO, COURTESY SOUTHERN KRAFT CORP

6—Some examples of the paper bags commonly used by retail dealers. Top, left to right: shopping bag with twisted paper handles, garment bag, bru bags of moisture-repellent kraft. Bottom, left to right: nail bag, beverage bag with carrying handles, bread bags, bags used for carrying bottles.

samples, promotional stunts, etc. These have a mailing card attached to the bottom, carrying the advertising or promotional copy and a space for name and address.

The user of bags today must study his requirements carefully. For example, he must decide what type of paper or which laminations of paper with other materials will give the required protection for the job.

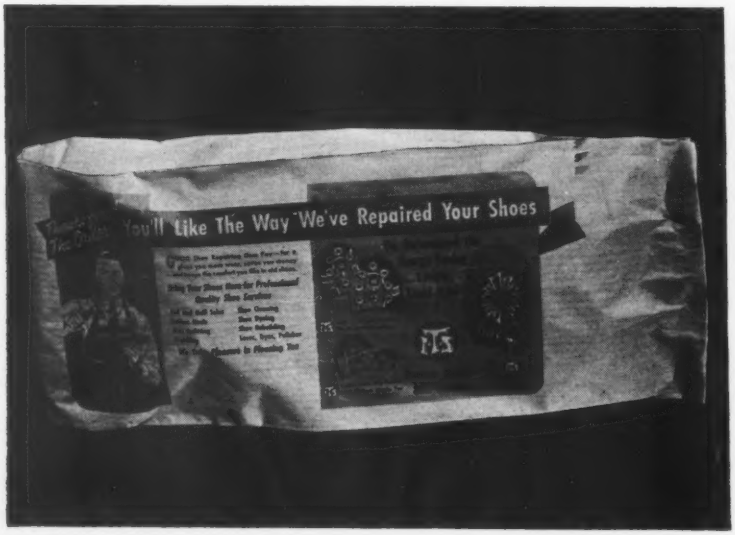
Methods of filling and sealing paper packages are outlined on page 728. The use of filling and sealing machinery has definitely contributed a great deal to the present usefulness of paper as a packaging material.

The paper bag is among the most economical methods of packaging. Machines for making bags are so highly efficient today that it is possible to buy as many as 30–50 standard paper bags for one cent. Modern high-speed machines are capable of meeting almost any production schedule to fill orders quickly under normal conditions. A single bag machine—depending upon the type of bag being made, the grade of paper used and the machine itself—is capable of turning out in excess of a third of a million bags a day, or, to state it another way, ten bags every second.

When bags began to take their place as standard containers for tea, coffee and spices and other food products the value of printing became important from an advertising standpoint. Today a variety of practical printing processes as well as specialized equipment have been developed for printing product identification, trade name and other information on bags.

7—(Left) This specialty bag for repaired shoes saves wrapping time and it carries an advertising message.
8—(Right) The laminated structure makes it possible to use this bag as a carry-out package for crushed ice.

PHOTOS 7 AND 8, COURTESY FLEXIBLE PACKAGING INSTITUTE





Specialty flexible containers*

Specialty flexible containers are made in the form of bags, envelopes and pouches. It is for this reason that there is an obvious overlapping in the services which these containers render to national packaging and the services rendered by ordinary bags and envelopes. The manufacturers of specialty flexible containers realize this, and because of it they desire to emphasize the fact that the difference between their products and ordinary bags and envelopes lies in the fact that the primary function of the specialty flexible container is to protect perishable commodities from becoming rancid, stale or otherwise losing their quality.

Ordinary paper envelopes and paper bags are used generally as simple carriers, but specialty flexible containers are also used as sales units and shelf packages in retail stores and other mediums of distribution. While it is true that the specialty flexible container is also a carrier, this function is only incidental and not of primary importance.

The specialty flexible container industry is a young industry, and its real importance and the extent of its activities has only recently been realized and recognized. In fact, it took the emergencies arising from war to really bring the industry into prominence.

The extent to which flexible containers may be used and the services which these containers can perform in protecting and merchandising commodities are only limited by the films which the industry converts. Fortunately for the industry, its suppliers have been successful in the past few years in introducing better and better films, and in so doing have extended and increased the potential markets for flexible containers. Manufacturers have also been extremely successful in devising ways and means of converting these better films into bags and envelopes. Even though these webs may be highly complicated, the materials which the industry converts consist of sheets of all kinds—paper films coated, laminated or both; transparent films such as cellophane and acetate; plastic films such as latex or the vinyls; and metal films.

Flexible containers are inherently light in weight, are packaged solidly, and thereby occupy little floor space and go a long way in effecting freight savings on finished goods in transit. Where air cargo shipments are involved, considerable savings in cost may be realized when goods are packed in flexible containers.

The products of the flexible container industry are extensively used in the packaging of most foods, chemicals, confections, tobacco, textiles and hosts of other commodities which are not in a liquid or semiliquid state. However, with the constant introduction of new and better films, it is conceivable that the flexible container may, in the future, be used as a container for semiliquids and even for liquids. It is also possible that the flexible container will be successfully vacuumized. While the industry at the present time makes no such claims, it is true that flexible packages have already been used for such purposes in a more or less experimental way, with at least some success. Such developments were postponed by the war and the industry has not had sufficient time since the declaration of peace to complete research and experimental work.

It must not be forgotten that specialty flexible containers are usually manufactured according to the needs and specifications required by the user. The films

* Material for this article furnished by the Flexible Packaging Institute.

PHOTOS 1 AND 7, COURTESY BENJAMIN C. BETNER CO.



1—These heat-sealed laminated bags are practical liners for boxes since they protect the contents for future use and are also resistant to water vapor.



2—Dog food goes to market in duplex kraft bags. The material protects the contents and may be colorfully printed with all the necessary information.

PHOTOS 2, 4 AND 5, COURTESY THOMAS M. ROYAL & CO.

3—(Below) This transparent flexible bag is topped by a paper header heat sealed directly to the body.

PHOTOS 3 AND 6, COURTESY CUPPLES-HESSE CORP.



4—(Below, left) The display area of this bag is fully utilized. 5—(Right) Dispenser bag for powder.



used for any individual package are only selected after the necessary research and laboratory tests prove that those films are the most desirable for the purpose. Under such scientific control, it is not hard to realize how highly specialized the flexible container really is.

A flexible package is outstanding as a unit container because it is possible to combine various properties inherent in individual films or papers into a single container. Where W.V.T. and grease-resistance or anti-corrosive factors are important, laminated papers or films are utilized to produce a simplex or duplex container with all of the protective requirements specified.

While the war did delay and postpone a considerable number of developments within the flexible container industry, it did, on the other hand, do much to advance other developments considerably. During the war, great progress was made in the lamination of films, particularly metal films, with other webs. This was also true of transparent films such as cellophane and latex. The war also encouraged the wider use of heat-sealed closures in the form of thermoplastic bands applied to the mouths of bags and envelopes. This development was of especial importance, as it offered a completely airproof seal and at the same time gave the additional advantages of speed and economy in packaging. Another development which took place during the war was in the use of wet-strength paper for frozen foods, fresh fruits, vegetables, meats, ice cream, etc.

While the principal function of a flexible container is to protect a perishable product, another important use for the flexible container is as a sales unit for distributing centers. It must at all times prove itself equal in the battle of the shelf or the showcase. For this reason, most manufacturers of flexible containers are equipped with art departments which prepare color sketches to meet any individual requirements. These designs are then printed by means of letterpress, rotogravure, aniline offset and other processes. The industry has for years been so conscious of the value of



6—Crisp potato chips seen through gaily preprinted waxed glassine have both eye and appetite appeal.



7—Chili package is of bleached white kraft with all-over two-color printing; liner resists grease.

beautiful printing and designing that it has made great progress in that direction.

There are a number of flexible container types. One of the oldest is the automatic self-opening bag which may be either duplex or triplex. The outside film generally is a bleached kraft, or sulfite, which is an excellent medium for high-grade printing. The inner lining, or linings, may consist of any film, usually selected because of some particular quality, such as resistance to oil, ability to act as a water-vapor barrier, etc. The automatic bag is an attractive container, well proportioned and extremely desirable for handling. In addition, it lends itself readily to automatic packaging equipment, due to the fact that it opens readily and stands solidly on a square, flat bottom. This type of container is used extensively for the packaging of flour, salt, tea, coffee, insecticide, fertilizer and chemicals.

The conversion of transparent films into bags and envelopes is one of the largest divisions in the industry. The feature of transparency alone proved to be of the greatest importance in flexible packaging, but when additional protection was also added, the demand for transparent flexible containers grew to even greater proportions. Even when transparency is not desired, these films are often used in lamination with other films, or as a liner for a flexible container, because they offer unusual protection to perishable products. The transparent films used by the industry are cellophanes of various grades, cellulose acetates, resins and rubber plastics such as Pliofilm. The lamination of any or all of these films with one another or to paper films has been one of the recent developments of the industry.

The introduction of transparent films also was instrumental in creating a new type of container in the industry, commonly known as the window-face bag. In this grade of merchandise, only part of the container is made from transparent film in the form of a window in the face of the package, while the rest of the bag is made from paper films of various descriptions, selected according to the user's requirements. The transparent windows within the bags can be made in the form of die-cut squares, or ovals, or may be full strips of transparent material running the entire length of the package. Windows of any size may be used and sometimes even the entire face of the package is made of transparent film. Window-faced bags and envelopes offer a number of advantages, including the fact that they are generally cheaper than all-transparent containers, but at the same time offer ample visibility. When the larger part of the container is made of paper, it will withstand hard handling. At the same time, these paper films offer excellent mediums for quality printing. All in all, the window-faced bag has become an important part of the flexible container industry, and its use continues to grow.

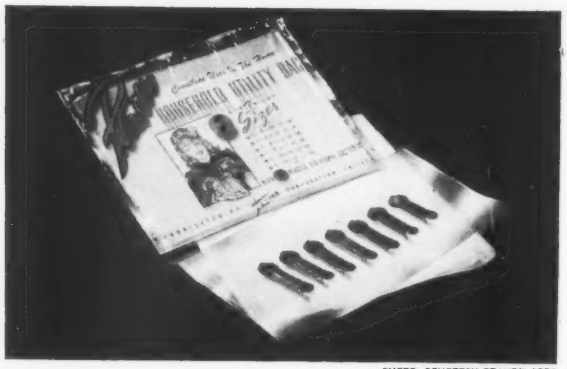
Glassine bags and envelope specialties are produced in the flexible container industry in volume exceeded only by that of transparent bags. This type of con-

8—Fresh fruits and vegetables are attractively merchandised in transparent flexible containers.

PHOTO, COURTESY GOODYEAR TIRE & RUBBER CO.



XUM



PHOTO, COURTESY TRAVER CORP.

9—The up-to-the-minute appeal of a new product is heightened by presentation in a modern package.

tainer is one of the oldest in the field, but the use of glassine specialties continues to grow year by year. Glassine is a semitransparent film that makes quite an attractive package because of its transparency, its cleanliness of appearance and because it lends itself as an excellent medium for printing.

As a material, glassine does not have great greaseproof or moistureproof properties. For that reason many glassine bags today are made from glassine films that have been lacquer-coated with the same type of coating used in making cellophane moistureproof. Bags made from lacquer-coated glassine are extensively used for foods requiring a very high degree of moisture protection.

Laminated glassines are also very important films in the glassine bag industry. These films are made from two sheets of glassine paper, which may be coated, or uncoated, and are laminated together by means of laminating agents; they, because of their characteristics, add to the moisture resistance of the resultant films. Not only are flexible containers made from such laminated films alone, but laminated glassine is used in addition as a lining in many other forms of flexible package. Packages made from laminated glassines are extremely effective in protecting perishable products from deterioration and have especially high merit in their resistance to moisture.

The waxed glassine bag is one of the most important. In the manufacture of this bag, the glassine film is first printed and then heavily waxed. This waxed printed film is then made into bags. The finished product is most attractive and, because of moistureproofness resulting from the heavy waxing, preprinted waxed glassine bags are extensively used in the packaging of many perishable products. This type of bag is extremely popular as a package for potato chips and many baking products.

Manufacturers of flexible packages, in conjunction with equipment makers, know the necessity for speedy handling, filling and closing of their products. Considerable attention is being given to the development of such equipment. Inexpensive means of closure such as adhesives and heat sealing are positive closures, and go a long way in ensuring delivery of tamperproof merchandise sealed in the factory.

Laminations may be coated or treated to permit heat-sealed or pasted closures. Combination closures of heat seal and adhesives are also effective. Thermoplastic (spot) applications are available as inexpensive primary or secondary closures. Steel ties are used where reclosure is an important factor.



10—The face of this flexible package carries a promotional message, the back is a lighting guide chart showing correct size bulbs for various fixtures.

Merchandise envelopes and packets

Envelopes provide convenient units for dispensing small quantities of a variety of products. They have the added advantages of affording a degree of protection for their contents and, by the use of individualized decoration, identify the manufacturer.

Terminology in the packaging field is very loose. According to one authority, the principal distinction between the flat bag and the envelope and/or packet is simply that the ends of the envelope or packet are die-cut in such a manner as to permit folding to form a wall, whereas the flat bag has serrated ends.

Merchandise uses

Merchandise envelopes and packets are particularly practical for packaging items such as:

1. Individual portions of powdered substances such as soluble coffee or chocolate for hot drinks
2. Small quantities of seeds, drug products, minute watch parts, phonograph needles
3. Small quantities of powdery substances which must be completely enclosed to prevent sifting
4. Flat objects of light weight such as hosiery, gloves, collars, dress patterns, notions, fishing flies, collectors' stamps
5. Samples for promotion and advertising

In size they vary from tiny $^2/_3$-in. by 1-in. envelopes with a center seam for minute watch parts, to $7^1/_2$-in. by $10^1/_2$-in. envelopes of general utility.

Merchandise envelopes offer more than a convenient and economical method of packaging the products listed above. They can be made of many types of paper, transparent sheeting and laminated film and offer all of the possibilities for color printing and pictorial presentations.

An interesting case of a dual purpose envelope is one used by a manufacturer of edible dyes. One side of the envelope tells the story of Easter egg coloring. When Easter is past, the other side of the envelope gives the story of food coloring for cakes, ices, etc.

Utility functions, too, are performed by merchandise envelopes. An example is the case of a manufacturer of automobile piston rings. As any automobile mechanic knows, the proper piston ring in the correct groove when "reringing" an automobile engine is vitally important for maximum performance. This manufacturer used identifying colors on the edge of his envelope to facilitate exact and rapid selection.



PHOTO, COURTESY PAPER PACKAGE CO.

1—The flat paper packet makes a convenient and a protective package for hosiery and similar items.

2—Sample-size flexible containers follow original consumer package design, maintain brand identity.

PHOTOS 2 AND 3, COURTESY THE AMERICAN PAPER GOODS CO.



3—Professional pharmaceutical packages made of bleached kraft or glassine have pasted closures.



XUM

Metal foil bags

by J. E. Dulaney

Metal foil bags have a variety of uses in the packaging field because of their high protective quality, eye appeal and convenience of filling and sealing.

Aluminum foil is particularly useful as a material for bags, because it not only has high moisture resistance, but also reflects heat and light and thus tends to maintain the temperature of the goods at the time they were wrapped. In certain cases, this feature is of prime importance. Aluminum foil prevents escape of flavor from the package, and it excludes all light from substances that would otherwise be subject to color fading and development of rancidity. Aluminum foil has another virtue which makes it especially useful as a packaging material: the development of rancidity is not catalyzed by contact with the bare metal, so foil makes an excellent package for potato chips, doughnuts, salted nuts and the like.

1—A variety of bags, in flat, square and envelope shapes, are all fabricated of printed aluminum foil.

PHOTOS, COURTESY REYNOLDS METALS CO.



During the war, metal bags were used extensively for packaging a large number of items, including medical supplies, food and all sizes of military equipment. These bags were made from a material consisting of composition lead foil laminated to various types of paper and films, heat-sealed to provide maximum protection against the hazards of overseas shipment.

A new laminated material has been developed from these war experiences which offers an excellent protective medium with heat-sealing properties and the eye appeal of aluminum foil. It is comprised of a thin sheet of aluminum foil firmly cemented to a supporting multi-ply structure of paper and wax, and forms perfectly into bags of various types, heat-sealed.

Spoilage by light is completely prevented by aluminum foil bags, since all radiation fails to penetrate the metal. Even sensitized photographic plates in foil bags may be exposed to direct sunlight without change.

Metal foil bags also have flexibility, which is of distinct advantage to both the manufacturer and consumer. To the manufacturer it means that empty bags may be stored flat, occupying very little space, and may be filled and shipped to destination points with far greater saving both in space and weight than many other types of container. To the consumer, it offers the advantages of easy storage on shelf or in refrigerator, quick and easy access to contents and simple disposal of container after use.

The use of opaque and transparent printing inks in combination with the natural brilliance of the metal itself results in a container possessing rare display values when used either singly or in groups. The unique ability of foil to attract the attention and the imagination of a passer-by, along with its protective qualities, are the chief reasons for its use.

Metal bags are made in both the square type and flat type and both are available in the duplex style, with various supporting laminations, such as acetate, vinyl resin and available films, together with the conventional paper-base stocks, to provide strong, yet attractive and serviceable, containers.

2—Photographic film is protected by a new six-ply, heat-sealing foil and kraft laminated material.



Fabric bags (unit containers)

by J. F. Rose

Peace has not brought any noticeable improvement in the conditions surrounding the fabric bag industry. Materials for the manufacture of fabric bags are not readily available, but their particular functions and uses remain the same.

Primarily, sewn fabric bags have been devised for novelties. Games, cigarette lighters and cases, vanities, jewels, watches, metal novelties, silverware, pipes, cameras, razors, toilet articles, shoe cleaners and shoe polishing articles and drug samples are among the items generally packaged in this way. To this list were added numerous articles originally packaged for the Army and Navy—parts for military mechanisms, medical instruments and supplies.

Sewn containers are fabricated in various textiles and materials appropriate for the product which is to be marketed. Among materials which have been found desirable for diverse purposes are: paper, cotton-wadding-lined paper, flannel of all kinds (including antitarnish flannel), duck, webbing, rayon, flannel-lined rayon, leather, leatherette, silk and transparent oiled silk.

Cotton-wadding-lined paper

Because of the scarcity of other materials, paper played a leading role in substitution. In the case of sewn containers, therefore, paper—lined with cotton-wadding—was among the first materials tested. Cotton-wadding-lined paper bags were extensively employed not only for replacement of more durable and more eye-catching materials but also for many purposes in connection with war production.

Although some manufacturers deplored the necessity for accepting the cotton-wadding-lined container, it was perhaps the most adaptable for all functions exclusive of appearance and durability. In connection with wartime use, the cotton-wadding-lined paper bag proved to be particularly suitable for the protection of small parts while in transit or while awaiting inspection and assembly. Later the bag could be discarded without incurring appreciable expense.

Antitarnish flannel

There is now a special dye process which renders flannel particularly appropriate for encasing silverware. This process reduces the amount of free sulfur (remaining in the flannel) to a minimum—free sulfur being the agent which accelerates tarnishing of silver—thus the name, antitarnish flannel. In addition to resisting undesirable tarnishing, flannel containers protect metal from disfiguring scratches which might otherwise be sustained through contact with hard surfaces. The colors which can be obtained by the antitarnish process are practically unlimited. Being at once durable and protective, the flannel case invites investment, from the aspect of design and eye appeal, for marketing purposes.

Canton flannel and webbing

During the war emergency, an interesting Canton flannel and webbing container had been developed for military use which will undoubtedly become a fixture in peacetime packaging. Medication, such as chloroform or methyl bromide, in a sealed ampul is placed in a bag and the open end subsequently closed and sewn securely. The bag protects the ampul from accidental breakage. When the ampul is purposely broken, the fabric container becomes saturated with the liquid, thereby permitting the desired escape of vapor while preventing the escape of harmful bits of glass.

Rayon, leatherette, oiled silk

These materials are appropriate for novelties, cosmetics, games, shoe kits, etc., when special protection is not necessary. They lend themselves to elaborate and artistic designs. In some cases flannel linings are used.

The major limitation of sewn containers is the fact that they are custom made, and therefore cannot be manufactured by entirely automatic equipment. The degree of protection offered by these containers is also limited, ensuring protection only against scratching, excessive contamination by dust or undue tarnishing. The cost of the container varies according to the material specified, elaborateness of design and construction and quantity ordered—sometimes averaging as low as $\frac{1}{4}$ cent per unit.

Sizes have ranged from the small case for jewels or tiny lenses to the container for a bomb nose.

The sewn container offers these positive advantages:

1. Obviates product depreciation due to superficial mutilation before and after purchase
2. Enhances the sales value of the article by lending a rich appearance
3. Provides a convenient means for handling items which would otherwise have to be wrapped and unwrapped. This advantage, on a large scale, becomes definitely a labor-saving economy
4. Normally available, at reasonable cost, in individual designs and in any quantity desired

A practical value has always been typical of the sewn container. This characteristic, so widely demonstrated during the war period, will certainly not be overlooked during peacetime.

XUM

Textile bags

by A. B. Merriam

Bags carry more of the world's goods than any other type of container. Textile bags, which have been used for centuries, will always be popular for their low cost, their economy of space and weight and the ease with which they can be handled and closed. Research laboratories in bag manufacturing plants are constantly developing new bag types, new materials for making bags and new uses for bags in solving packaging problems. Burlap, cotton, woven paper and expansible tubing are popular textile bag materials.

Burlap bags

Burlap is the cheapest of all textile bagging materials, and bags made from it are highly satisfactory containers for a great variety of commodities. Burlap is woven from jute, which is the fibrous part of a plant grown in India. This fibre is coarser than cotton, and the burlap cloth woven from it is not so uniform as cotton goods.

Most burlap is woven in India and, in normal times, the cloth made by each burlap mill is regularly inspected and tested by one of the large bag companies, in cooperation with other bag manufacturers. The goods are inspected for all characteristics important to the burlap bag trade, the most important being tensile strength, full weight and width, satisfactory color and freedom from weaving defects. All jute mills in India are divided into four groups, A, B, C and D, indicative of the relative quality of their product.

Burlap is made in many widths, weights, counts and finishes. There are also differences in the quality of jute from which the cloth is woven. The most common widths are 36 in. and 40 in., but many other widths are available. The weight is expressed in ounces per yard of goods in 40-in. widths. The commonest are $7^1/_2$-, 8-, 10-, and $10^1/_2$-oz. weights, but many other weights are obtainable. In weaving the count, the "porter" (number of warp or lengthwise yarns per $^{37}/_{40}$ in.) is named first, followed by the "shot" (number of filling or crosswise yarns per inch). Thus, "11 by 12" means that the goods have 11 lengthwise yarns per $^{37}/_{40}$ in. and 12 crosswise yarns per inch. Typical counts are 9 by 9 for $7^1/_2$-oz., 11 by 12 for 10- and $10^1/_2$-oz. goods.

The tensile strength of burlap goods is the result of several factors, including the quality of the jute fibre used, the amount of twist put into the yarn during the spinning operation, the weight of the yarn and the count of the goods.

Nearly all burlap goods are finished by running them once through a calender. However, various special finishes may be obtained where an attractive appearance is desired. Goods which are to be specially finished are generally woven from carefully selected jute having a uniform light color.

Burlap bags are well adapted for rough handling where strength and resistance to snagging and tearing are important. The natural color of burlap makes their use desirable under conditions where cotton bags would quickly become soiled and unattractive. Burlap bags are made in a range of sizes and capacities. There is a marked trend toward the adoption of the 100-lb. bag, which can be handled easily by one man, although larger and smaller capacities are also used.

Cotton bags

Cotton bags are more generally used where appearance and cleanliness are important. Prior to 1900, cotton goods for use in bagmaking were produced

PHOTOS, COURTESY BEMIS BRO. BAG CO.



1—Seamless cotton bags are often used as multitrip containers. These bags frequently last as long as ten or fifteen years, making scores of trips.

largely in New England mills, but since that time there has been a gradual migration of these mills to Southern states. Through research, improved equipment and increased efficiency, considerable progress had been made in standardization, consistency of quality and finish of cloth.

In classifying cotton goods, the measure used is the number of yards of the type in question required to weigh 1 lb., mentioning first the width of the goods. Thus a piece of cloth 37 in. wide, of which it takes 4 yd. to make 1 lb., is known as 37 in. 4.00 yard. Another factor important in classifying goods is what is known as the "count," that is, the number of threads per square inch of cloth in both the warp and woof direction. Thus a piece of cloth that has 48 threads in the warp direction each inch and 44 in the woof (generally known in the textile industry as "filling") direction per inch is said to have a count of 48 by 44.

There are three main divisions of cotton cloth used for bags—sheetings, Osnaburgs and print cloths. Generally speaking, the sheetings and Osnaburgs are used for 100-lb. bags while the print cloths are used for smaller bags, although there are lightweight sheetings also used for small bags.

Sheetings—Sheetings are generally made in a balanced construction, one in which approximately the same number of threads run in both the warp and filling directions thus giving the cloth a nearly equal strength lengthwise and crosswise. The common sheeting constructions have about 48 threads per inch in each direction. Varying weights of sheeting are made, the heavier ones being used for 100-lb. bags and the lighter ones for smaller sizes. The weight of the goods is, of course, determined by the weight of the individual threads that are used in making the goods.

Common sheetings used for 100-lb. bags are usually 37 in. and 40 in. wide. Well-known sheeting constructions used for 100-lb. bags are 37 in. 4.00 yard, 36 in. 2.85 yard, 40 in. 3.75 yard, 40 in. 3.25 yard, 40 in. 2.85 yard and 40 in. 2.50 yard. Lighter weight sheetings used for smaller bags are 31 in. 5.00 yard, 27 in. 6.90 yard, 36 in. 6.50 yard and 36 in. 6.15 yard.

Osnaburg—This is a coarse, heavy-duty cotton fabric made in medium and heavy weights and generally used for 100-lb. bags, although sometimes employed for packing 50 lb. of heavyweight products such as seed corn, potatoes, etc. The principal heavyweight Osnaburg constructions are 30 in. 2.35 yard, 36 in. 2.35 yard and 40 in. 2.11 yard. These are used principally in packaging such products as cement, chemicals, fertilizer, flour for export and other packages destined to receive rough treatment. Lightweight Osnaburgs commonly used for 100-lb. bags which are not subjected to such rough treatment are 36 in. 4.05 yard, 36 in. 2.95 yard and 40 in. 3.65 yard. These goods are used for containing coarse materials such as feed and salt.

Print cloths—Print cloths derive their name from the fact that they generally resemble printed cloths used in garments. They are of higher count and lighter weight, generally speaking, than sheetings and Osnaburgs and consequently are used for smaller packages, especially for those containing finely ground materials such as flour. The common print cloth construction used by the bag industry has a count of 64 by 56 and comes in varying widths so that the weight of the goods is as follows: 38½ in. 5.50 yard, 32 in. 6.62 yard and 27 in. 7.85 yard. These goods are usually bleached before being used, although many sugar bags are made from the goods in their grey form.



2—At beet sugar factory, 10-lb. filled cotton sugar bags are loaded into 100-lb. burlap balers.

Seamless cotton bags—This is another important type of bag made from Osnaburg cotton woven in the form of tubing. The bottom is also woven into the bag so that there are no seams in it. These bags are excellent for multitrip or heavy-duty service and were originally produced for shipments of seed. Since that time, how-

3—Bags used for export purposes get rough treatment, must be strong and durable to make these trips.







4—(Left) Consumer-size open-mesh bags are carefully sewn and inspected at the factory. 5—(Right) The same open-mesh bags are used for fresh fruits and vegetables. They make a colorful display in a retail store.

ever, they have also been used for shipments of grain, flour, sugar and beans where the shipper desires to use the bags over and over again.

Re-use bags

Textile bags have great value for their re-use possibilities and, because of this salvage value, the manner in which they are opened is extremely important. If the tops are cut, torn or punctured, the re-use value of these bags is likely to be zero. To open a bag tied at the top with twine, it is simply necessary to cut the twine without cutting the cloth. A bag tied with a wire tie can be opened by untwisting the wire by hand. A hand-sewn bag is opened by cutting the twine and pulling it out. Bags sewn by machine can easily be opened without damage, since a chain stitch is used so that if the two ends of the twine are pulled the stitches will unravel readily. In normal times, secondhand bags go largely into certain definite channels, but in these times when production schedules are loaded to capacity and the supply is short of the demand, careful salvaging of every bag is one way to augment supply.

Few people consider the re-use feature of a textile bag in the same light as such premium features as tumblers for cheese, cookie-jar packages for crackers or fancy cake boxes for fruit cake. Nevertheless, it is estimated that millions of women and children are wearing clothes made from flour and feed bags. Such bags are made from regular 100-lb. bag constructions, such as 37 in. 4.00 yard and 40 in. 3.75 yard, which the manufacturer has had printed with dress prints. Two or three feed bags provide enough material to make a stylish dress.

Washout inks

An important advance in bag manufacturing in recent years has been the development of washout inks used for printing brands on textile bags. Most bag manufacturers today are using inks which can be easily removed from the goods if the directions for washing are carefully followed. Usually, the best method of removing these inks is to soak the bag overnight in warm soap suds, squeezing the suds thoroughly through the goods so as to be sure that the water and soap can dissolve the inks. The following morning the bag should be scrubbed thoroughly and if all ink is not removed after such scrubbing, the bag should be boiled for 10 min. in soap suds. Bag manufacturers warn that many old-fashioned ideas, such as covering the printing with lard or soaking the bag in kerosene, retard, rather than aid, the removal of inks.

Textile-paper bags

For many years there was a need for bags in which special protection features were incorporated. To meet this need, bag manufacturers developed combination textile-paper bags. This type of bag is known in the trade as WPPL (waterproof paper-lined). Products such as chemicals, fertilizer, animal and poultry feeds and many human food products which would be unsuited to ordinary textile bags can be successfully packed in WPPL bags. These containers give products protection against loss or absorption of moisture, sifting, contamination and damage from insects. WPPL bags are tear-resistant and puncture-resistant, easy to fill and handle thus saving time and money.

The kinds of textiles and papers and the adhesives used depend upon the protection required. Most products require a bag made with an inside layer of flexible creped kraft paper impregnated with a layer of waterproof adhesive which seals the pores of the outside layer of burlap or cotton and cements both layers together. An asphalt adhesive is generally used to bind the paper to the fabric. Special papers, plastic films and special adhesives are furnished when the products packed require such protection.

A recent development in this field is the use of cemented seams instead of the conventional sewn seams. Cemented seams eliminate stitch holes, thereby affording additional protection for the contents of the bag.

There are several effective methods of closing the filled bags. They can be closed by wire tying or machine sewing, and several special tape closures are available if this additional protection is needed.

Loose paper liners

Loose liners fall into two classifications—the single-stretch and the double-stretch types. Single-stretch liners have about 33 per cent stretch around the width of the bag but no stretch in length. Double-stretch liners have approximately 33 per cent stretch in both directions. The stretch feature—aside from the care exercised in insertion, filling and closing the container—has more bearing on the performance of the liner than any other item. To avoid placing strain on the liner, its minimum stretch must equal the stretch of the outer textile bag in every direction. Some liners are treated with various coatings and impregnations to make them moisture-resistant and grease-resistant.

The efficiency of the loose liner, however, is dependent on the care with which it is handled. The fit of the liner must first be carefully determined. The way it is inserted into the outer textile bag is likewise important. This must be accomplished so there will be no strain exerted on any part of the liner when the bag is filled. Special attention should be given to closing the liner and the outer bag. The liner should always be closed independently of the outer bag because any closure of the outer bag which includes the liner is likely to cause strain and breakage.

Woven paper bags

Woven paper bags are made of strips of tough paper spun into yarn and woven into open-mesh cloth. These bags are used extensively for shipping many kinds of fresh fruit and vegetables. They were originally designed for use in packing onions, but in recent years their use has been extended to many other products such as cabbage, carrots, beets, turnips, green beans, green corn, green peas, garlic, apples and oranges.

Woven paper bags are made in large sizes, usually 50-lb. sizes for bulk sales, and in consumer sizes for retail sales. They are made in various colors either to harmonize or to contrast with the contents of the bag. These bags have a strong sales appeal because of the visibility of the contents and the colorful displays they make in retail stores. In the past few years there has been a great increase in the number of self-service stores. Open-mesh bags in consumer sizes are in great demand for this type of store due to the fact that no clerks are required to count out or weigh produce items which are packed in these bags.

Expansible tubing

This is a comparatively new development in bag manufacturing. Expansible tubing consists of a continuous tube of cotton or burlap cloth sewn on the bias. In use it is cut off as required to cover a given object with little waste. Due to its expansibility, it is used effectively where articles of varying sizes and shapes are packed. Formerly pieces of cotton or burlap cloth were cut to the proper size to cover such objects and then hand-sewn around each individual object. Expansible tubing saves time and labor in the packing room and thus cuts packaging costs substantially.

Specifications for textile bags

Textile bags are in most cases custom-made for the product to be packed. Before the proper bag may be recommended these factors must be known:

1. Fineness of the product
2. Flowing qualities
3. Weight per cubic foot, loose or settled
4. Percentage of moisture contained
5. Needed protection against moisture loss or gain
6. Hygroscopic or deliquescent properties
7. Chemical action on fabric or paper
8. Type of package now used
9. Filling, weighing and closing method used
10. Where and how it is shipped—rail, truck, air or steamship
11. How it is handled
12. How it is stored

When these factors are known, a bag which will carry the product safely can be readily designed by competent bag engineers. A number of materials and combinations of materials are available for making bags which will afford almost any desired protection.

Testing textile bags

In order that a newly designed bag may have the proper tensile strength and the proper protective features, tests are usually conducted in a bag-testing labo-

6—Dress-print bags, the most popular animal and poultry feed containers, here are filled and closed.



ratory. These tests approximate closely actual handling, shipping and storage conditions. To assure a completely satisfactory bag it is also common practice to make several actual shipping tests.

To determine ruggedness or strength, drop tests are usually made. A number of flat drops (landing on face and back of bag) are made from a height of from 4–10 ft. depending upon the severity of the service expected from the bag. This is combined with a number of butt drops (landing on ends of bag) from a height of 2–5 feet. A drop-testing machine is used in most bag laboratories since dropping by hand is likely to be inaccurate.

Bags may be tested for loss through sifting by drop tests, by tumbling tests or by use of a vibrator. In modern laboratories, bags may be submitted, when necessary, to such severe tests as complete submersion, arctic or tropical temperatures and puncture. Special apparatus has been designed to make these tests.

Handling textile bags

In addition to the proper selection of a textile bag for a particular job, proper handling is essential to its successful use. The Association of American Railroads has given a great deal of attention and study to the subject of proper loading of textile bags. Rules have been set down for preparing cars for loading with attention to such important factors as having cars carefully cleaned, removing protruding nails and covering of bolts and sharp edges with pads.

Special instructions have been issued for loading in order to prevent friction of bags caused by rubbing against car walls and to prevent shifting in transit. The system of loading, known as the key sack method, is said to have greatly reduced claims on flour shipments. Bag users are also cautioned against employing hooks or other unsuitable loading devices.

Bag-packing equipment and conveyors may cause much damage to textile bags. Rough edges, splinters and sharp metal parts are also causes of damage.

The principal bag manufacturers have compiled much useful information concerning the care, storage and handling of bags, and the best way of loading filled bags in freight cars to ensure the maximum safety to perishable products.

7—Waterproof combination textile and paper bags guard high temperature cement from moisture, dust.



Methods of closing textile bags

Common methods of closing textile bags are:

Machine sewing—Machine sewing is found advantageous for volume production. After passing the filling spout, the bags move by conveyor to a sewing machine through which they are guided by hand (Fig. 2). The usual stitch employed is the double-lock stitch. Four stitches per inch is common practice except for finely powdered materials, where a closer stitch is desirable.

As a guide to determine what quantities of sewing thread should be carried in stock, it is convenient to know how many pounds of thread are needed to close 1000 bags of a given size. One bag manufacturer furnishes a table for this purpose; it shows, for example, that 2.0 lb. of thread are needed to close 1000 bags 19 in. wide, using 4/12 thread in the needle and 3/12 thread in the looper.

Hand sewing—Bag closing by hand sewing is generally accomplished by means of a large needle made especially for bag closing. A loop stitch over the rolled bag mouth is used. Ears are formed at each edge of the bag. The table referred to above also shows twine consumption data for hand-sewn bags.

Wire tie—This method is also a hand operation. The mouth of the bag is gathered together and twisted slightly. Then a piece of malleable wire looped at both ends is twisted with a hand-tying tool.

Tape sealing and heat sealing—The use of cemented tape over the mouth of a bag with an attached liner made of laminated materials to effect a closure is now coming into wide usage. A heat-sealed closure is also used for these types of bag.

Friction-operated bag closure—A lightweight hand-operated sewing machine is used where a sewn closure is desired, but where production is limited and a motor-driven bag-closing machine is not warranted. This device works by friction and is very efficient.

Rip-cord closure—This is used on multiple-trip bags such as Osnaburg cement bags. A heavy cord is sewn to the top of the bag with special thread. A quick jerk of the cord opens the bag.

An important consideration in closing textile bags is the amount of "spill room" allowed. A bag cannot withstand severe drops or shocks unless there is some space for the load to shift. This is a feature of hand sewing which should be carefully watched, since the bag sewer may not always allow for sufficient "spill room." As a general rule, there should be a minimum of $1/2$ in. and, preferably, it should be allowed from the top of the contents to the closure. This measurement should be taken with the bag standing on its butt and both sides of the top of the bag brought together. More "spill room" should be allowed in a 100-lb. bag than in smaller sizes, as the stress and strain are greater.

Heavy-duty multiwall bags

In 1942, about 1,000,000,000 multiwall valve bags were shipped to American industries for the packaging of approximately 300 different commodities. Frequently they have substituted for steel and fabric, and they can even be loaded with molten compounds at 450 deg. F. As proof of their durability, they have survived the hazards of recent wartime shipping.

The father of the multiwall valve bag is Adelmer M. Bates. One day, around the turn of the century, this young salt salesman received a letter from his wife. As he read it at the breakfast table, the salt shaker fell, sprinkling salt over the letter. One corner of the paper was folded in a peculiar way, and he suddenly thought of the idea of the valve bag which not long afterward became a reality.

He next devised machinery for automatic filling and, with the cooperation of the cement industry, was able to perfect his machine and the practicability of the valve bag. Bates' initial efforts in the cement field resulted in development of a single-wall heavily constructed cement bag; his inventions, patented in 1898, have resulted in the familiar valve bag of today, and the machinery designed to fill it. It was not long before the commercial world began to take notice and more and more packers cast envious glances at paper bags as a solution for mass production in their industries.

The early bags were not multiwall bags. They were a single-wall type, made of salvaged rope stock from ships and docks and construction jobs. They were used widely for flour, cement, plaster, lime and other building materials. Such containers were about the only kind of heavy-duty paper bag used before World War I. At that time the shortage of shipping cut off supplies of hemp, and salvage rope became scarce. Bag makers began experimenting with kraft mixed with rope fibres, sisal and jute. Eventually they made bags entirely of No. 1 kraft.

Development of multiwall bags

Heavy kraft sheets were not flexible. Further experiment showed that two separate walls or plies of lighter weight kraft sheets nested by means of corn, tapioca or potato paste made a duplex bag—stronger and with greater flexibility. Soon the advantages of more plies were apparent, but not until further development of machinery for making bags of more than two plies did the progress of the multiwall bag get into its present stride. Until about 1925 all of these bags were of the pasted, satchel-bottom type. Then a method of sewing the ends was discovered which made it possible to combine a number of sheets.

This was the real beginning of the multiwall paper bag as it is known today, with the many combinations of sheets to meet each specific requirement of the more than 300 products packaged. Since 1935, the number of these bags used has tripled and the list of products packaged in this manner now includes chemicals, building materials, foods, animal feeds, drugs, fertilizers, seeds, fuel, explosives and many others.

The modern multiwall bag is usually made with three to six walls of kraft paper, depending upon the weight, density and physical characteristics of the product it is intended to carry. There is a possibility that it may be made with as many as eight plies in the future. Each ply is arranged in tube form, one within the other, so that each bears its share of the burden. Greater flexibility and strength are obtained by using several walls in relatively light basis weights rather than one wall of heavy paper. A further advantage to the user is lower cost. In the case of the multiwall bag, each ply can be treated specifically to meet its requirement, whereas if a single-wall bag were used, the entire sheet would have to be treated for each require-

1—For the gardener, one large bag contains unit packages of items for pest control and plant health.

PHOTO, COURTESY COURTMAN CHEMICAL CO.



ment. It is less expensive to color, say, a 50-lb. outer sheet, moistureproof a 40-lb. inner ply, treat another 40-lb. ply for wet strength than to process a 130-lb. basis weight single-wall sheet to meet all three requirements. Adding color to the heavy sheet, alone, would cost nearly four times as much as it would cost to color a 50-lb. sheet.

The average heavy-duty multiwall bag is constructed usually of several sheets, each 40- to 70-lb. basis weight (reckoned by weight of 500 sheets 24 in. by 36 in.). The most frequently used paper sheets are in the 40- to 50-lb. basis weights.

Custom made

The multiwall bag is custom made. Size and construction cannot be made up in stock items because each product packaged has different requirements. Size depends upon the weight per cubic foot of the product to be packaged. For example, 100 lb. of cement is not comparable with 100 lb. of flour. Construction depends upon the physical and chemical characteristics of the product as well as on the circumstances of shipment and use. Some products must be protected from loss of moisture; others must be provided with barriers to keep moisture from being transmitted into the bag. Some products must be packed in a bag that can withstand high temperatures; others must be provided with walls that will not crack at low temperatures. Sometimes all of these requirements and more must be included in the bag construction for just one product.

Before suppliers of multiwall bags recommend a bag suitable for a particular product, it is helpful for them to have such data as the following:

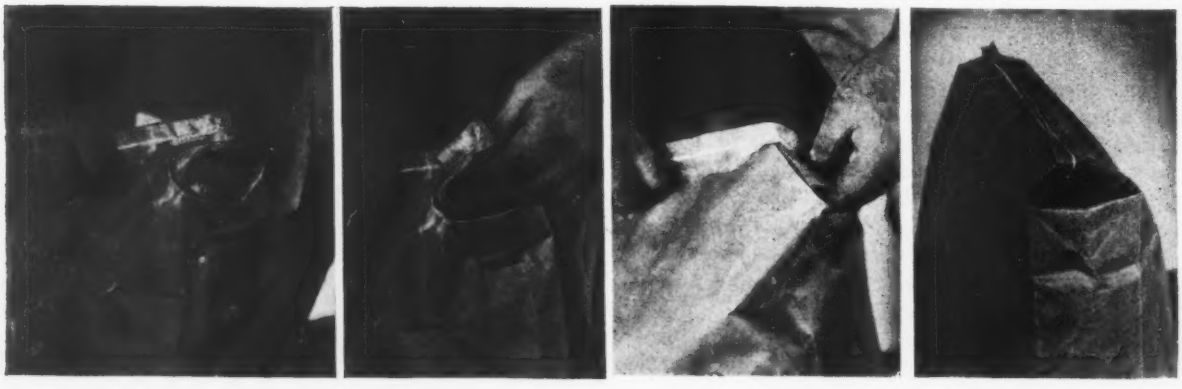
1. Name of the product
2. Characteristics of the product to be packed
   a) Fineness
   b) Flowing qualities
   c) Weight per cubic foot (1) loose (2) settled
   d) Temperature when packed (if hot liquid, the cold flow properties of solid)
   e) Percentage of moisture
   f) Required protection against moisture loss such as is likely in normal atmospheric conditions.
   g) Hygroscopic or deliquescent properties
   h) Chemical action on paper
   i) Poisonous or dangerous qualities
3. Present package used (a) type (b) cost (c) weight per unit (d) protective liners, coatings
4. Present filling, weighing and closing method
5. Seasonal or year-round production
6. Type of shipments in general use: carload, LCL, truck, barge, export, air, or any other
7. Conditions of handling
8. Value per unit of product (lb. or ton)
9. End use of product
10. Special storage conditions

Such data help to furnish a background to the technical department of a multiwall bag manufacturing concern for its work on the development of a satisfactory bag and packaging equipment. Usually, technicians and engineers work right in the plant of a prospective user to get a complete picture of a particular problem and to make tests of bags under actual conditions of use. Only after that are they ready to suggest size, construction, closing, sealing and filling methods. From such study, they may determine which of the dozens of different sheets that may be used for the plies will give the best performance. They can recommend which special treatments, finishes, coatings and impregnations are required in order to provide:

1. Waterproofness
2. Moistureproofness and vaporproofness
3. Greaseproofness
4. Resistance to chemical action
5. Resistance to temperature extremes
6. Resistance to gases and smoke
7. Resistance to abrasion
8. Resistance to infestation
9. Resistance to sifting
10. Protection against mildew and bacteria
11. Easy emptying
12. Resistance to scuffing

2—(Left) Opening is left in factory-closed valve bag with inner sleeve. 3—(Left, center) Pressure of contents flattens, closes valve. 4—(Right, center) Inner sleeve is folded. 5—(Right) Valve and sleeve closed.

PHOTOS 2, 3, 4 AND 5, COURTESY ST. REGIS PAPER CO.

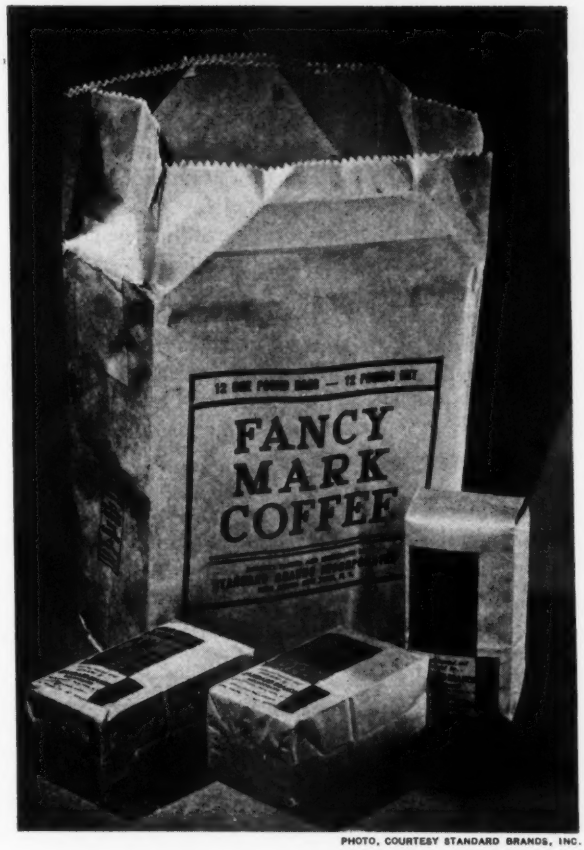


Several years ago, a multiwall bag supplier was asked to design an economical, one-trip container for calcium chloride to replace steel drums which were expensive, bulky to store and required extra bookkeeping.

Calcium chloride must be delivered dry and free-flowing. It must be packaged at 205 deg. F. It is so hygroscopic that moderate moisture cakes it; so deliquescent that excessive moisture sends it into solution. To meet these requirements, a five-ply bag was developed which performed the job so successfully, it is currently used more or less as a yardstick for comparing packaging problems with similar characteristics in greater or lesser degree. Three of the plies are kraft and the two inner ones are a special asphalt laminated sheet highly resistant to air-borne moisture and to capillary action.

The usual packages for asphalt had been clay-coated steel drums. These required a great deal of metal and could not be re-used because they had to be destroyed to remove the solidified asphalt. Packaged at temperatures up to 450 deg. F., molten asphalt called for a container that would resist this heat and, at the same time, have the necessary strength to cope with its cold flow characteristics.

Molten asphalt is now being successfully packaged in a multiwall paper bag. A liner of natural kraft paper coated with a special clay and casein formula is performing this service. This coating will stand temperatures of more than 450 deg. F. and prevents the penetration of molten asphalt into the paper. The liner prevents the asphalt from sticking to the paper after it has cooled.



PHOTO, COURTESY STANDARD BRANDS, INC.

6—Large multiwall paper shipping bag makes strong, compact container for twelve 1-lb. paper bags.

Types of ply

Laminated kraft papers—Two lightweight kraft papers laminated with a continuous film of asphalt have exceptionally high water and moisture resistance qualities and are the best all-round moisture-resistant paper at relatively low cost. The melting point is approximately 170 deg. F. Asphalt can be obtained in higher melting points where absolutely necessary. However, such sheets are inclined to become brittle, particularly when exposed at cold temperatures.

High-sized and moderately high-finished papers—These are available as outside walls, particularly on fertilizer bags. They withstand rain well. Tub-sized sheets are made for outside walls to be applied where scuffing is apt to cause heavy breakage. Wet-strength sheets are especially treated to provide higher scuff and abrasion resistance, and are used as inner plies in bags for products packed wet to prevent the disintegration of paper.

Crepe kraft—Crepe kraft is used in the tape of sewn-end bags and for tuck-in sleeve valves. In some instances, it also has an advantage as one or more plies in the body of the bag.

Wax papers—These are treated with both paraffin and microcrystalline waxes and are used to provide moisture resistance. Such sheets have a wide range of temperature resistance, but should be used only within limits recommended as the result of careful testing.

Kraft paper, treated by immersion in an asphalt-wax combination—Kraft paper treated thus is not as moisture resistant as the asphalt-laminated paper. It transmits more moisture, but it also transmits less than regular untreated papers. Such a paper may also be treated to resist the penetration of grease.

Glassine—Glassine is used as an inner liner to resist penetration of oils or greases that might ordinarily be absorbed from the bag contents by natural kraft and similar papers. Sometimes two glassine sheets are laminated together with a wax base adhesive for this purpose. This type of sheet is used as a liner in bags for such products as sweeping compounds. It also has high moistureproof qualities, but very hygroscopic materials such as calcium chloride will dehydrate the glassine and cause it to shrink and become very brittle.

Cellophane, Pliofilm, metal foil and parchments—These are also used for special protective purposes and, in the construction of multiwall bags, are usually laminated to one of the plies, depending upon the requirements.

Arrangement of plies from inside to outside is usually determined by the requirements of the product and combinations may be in the order best for the job.

Generally speaking, heavy-duty multiwall bags are made in sizes to contain from 25 to 100 pounds. The latter figure is about the largest quantity that can be carried. Linear measurements usually start at about 10 by 25 in. and increase to 20 by 50 in. with $\frac{1}{2}$-in. variations in length or width. Often density of product necessitates such variation. For example, lime bags of the same weight capacity may be 17 by 29 in. or 20 by 40 in. depending upon the density of the product, as some lime compounds are denser than others.

Adhesives used between the plies are mostly of vegetable origin, although animal glues are occasionally used. Latex, when available, is one of the best waterproof adhesives for this purpose. Reclaimed rubber glue has proved a satisfactory replacement for latex.

General types of multiwall bag

The valve bag—The top and bottom of the valve bag are closed either by sewing or by pasting and one small opening is left in one corner. This valve serves to admit the material into the bag. The valve closes automatically and instantly because of the internal pressure of the contents of the bag as soon as it is filled and dumped on the floor, slide or conveyor belt. To ensure against moisture penetration and sifting and to give added protection against penetration of microorganisms, the valve of the multiwall paper bag may be equipped with a "tuck-in" sleeve which is tucked into the valve as soon as the filling is terminated. Today, ends are dipped for added protection to contents.

Variations of the valve bag include the LC sleeve bag, the fully extended valve flap bag, the single ply extended valve flap bag. In some valve bags perforations are made under the valve to allow for the escape of entrapped air during the filling process.

Open-mouth bags—Open-mouth bags are factory closed only at one end; the other end is left open. This type of bag is usually filled from a hopper. The bag is held in position manually or by a bag-holding clamp which is designed for this purpose.

Open-corner bags—These are sewed-bottom bags. The open mouth is partly closed by sewing, an intermediate variety between open-mouth and valve-type bag. Open-corner bags are often used for packaging commodities which are liquid when poured hot into the bag, but which harden as the product cools. This type of bag is closed by stapling the open corner while the product in the package is still in a hot and liquid state.

Packing and closing

Multiwall valve paper bag packing machines are of four basic types: screw, belt, impeller and gravity—so called because these are the methods by which the materials are propelled through the filling tube and into the bags. Adjustments and variations of these four types have been developed for more than 100 products. Number and size of filling tubes vary with required production. Machines are adjustable for various bag sizes. Products may be pre-weighed, or filled and weighed simultaneously.

Open-mouth bags are closed by sewing, wire tying, stapling or with gummed tape. The sewn type closure can be accomplished automatically with sewing equipment which applies a bound-over tape and filler cord and penetrates all plies of the bag. The wire tie is efficient for applications where the number of units packed does not warrant installation of automatic equipment. A hand-twisting tool constitutes the entire equipment for effecting a securely tied closure around the neck of the bag. Stapling can be done by hand or with automatic equipment. This type of closure is used for bags containing such products as potatoes, coal and asphalt. Gummed-tape closure is accomplished by folding the plies of the bag at the top and sealing the final fold with gummed tape. This technique is most commonly used for smaller sizes. (For more detailed information on various types of closures, see *Bag Sealing and Closing*, p. 260.)

The shortages of fabrics and metals which caused many packers to turn to the multiwall bag during wartime are continuing after the war. Meanwhile, the multiwall bag has proved its adequacy, so in many instances it is likely to remain. Companies which had used fabric bags previously, adapted existing bag-closing equipment to handle paper bags with very slight changes in most cases and with a minimum of critical material. Bag packers, sewing machines and wire ties required for the conversion from critical containers to less critical containers are available for use.

Multiwall paper bags for AN and Government use

At the beginning of the war, the multiwall paper bag industry was called upon to study the overseas shipping problems and develop multiwall paper bags which would protect products being shipped against the numerous and unusual hazards encountered, such as tropical heat, subarctic cold, submersion and exposure to the elements. After tests were made, multiwall paper bag specifications were written and included such special construction features as the use of:

1. Multiwall specification kraft paper, ensuring strength and preventing contamination or infestation of the product from outside sources
2. High wet-strength papers which will not disintegrate when subjected to submersion in water for a period of 24 hours
3. Moisture-resistant papers to prevent the penetration of water-vapor
4. Greaseproof papers to prevent the penetration of grease through the plies of the paper bag
5. Special sheets designed to resist chemical actions, offering protection against disintegration of the paper by chemical action of the product packed, or protecting the chemical content of the bag from destructive action of outside elements
6. Sealing-compound dipped ends to prevent the

penetration of water or water vapor through the sewn ends of the bag

The following multiwall paper bag specifications are still in effect with the United States Army, United States Navy and Government agencies for overseas shipment:

1. The U. S. Treasury Department Procurement Division specification covering the export shipment of chemicals
2. The U. S. Treasury Department Procurement Division specification covering the domestic shipment of chemicals
3. The U. S. Navy Bureau of Supplies and Accounts specification 53S4 for overseas shipments of inorganic chemicals
4. The U. S. Navy Bureau of Supplies and Accounts specification 53S5 for domestic shipments of inorganic chemicals
5. 1766-A for the War Food Administration covering the export shipment of certain food and agricultural products
6. O.Q.M.G. 103-A, for the U. S. Army Quartermaster Corps covering the exportation of certain subsistence items into the various combat areas
7. 27-B-17 (INT). This is a set of specifications similar to Army's O.Q.M.G. 103-A. It is being adopted by the U. S. Army Bureau of Supplies and Accounts for shipments of flour, sugar, salt, rice, peas, beans and dehydrated soup products such as green pea and bean soups
8. 53B9e, for the U. S. Navy Bureau of Yards and Docks covering the domestic and export shipment of cement in five types of multiwall bags, depending upon the service and the destination
9. The Rubber Reserve Company specification of December 1, 1944 for both domestic and export shipments of GR-S (amended Feb. 15, 1945)
10. The Rubber Reserve Company's specifications of June 1, 1944, covering bags for domestic and export shipment of GR-M (neoprene)
11. UU-S-48, for the Bureau of Standards describing types of paper shipping sacks and setting up minimum test standards for the papers to be used in their construction
12. Joint U. S. Army and Navy general specifications covering many types of containers including multiwall paper bags
13. U. S. Marine Corps specifications for overseas shipments of cement

Future of multiwall bags

Multiwall bag manufacturers say few industries that have used multiwall bags will ever go back to other containers.

The great efficiency, easy handling and small-space storage requirements of these bags give them distinct advantages. However, during the next few years, it is expected that competition will be keen among all package suppliers to retain gains made during the period 1935–1941.

But the majority of multiwall bag manufacturers do not consider their gains entirely a wartime condition. During the past three years, production has been increasing because many of the products now packed in multiwall bags represent new uses. If these new uses continue, then bag production is bound to remain at a high level.

Multiwall bags are custom made to fulfill the different size and construction requirements of a variety of products. 7—(Left) Six-ply multiwall bag. 8—(Center) Pasted valve bag. 9—(Right) Sewed valve bag.

PHOTOS 7, 8 AND 9, COURTESY INTERNATIONAL PAPER CO



XUM

Bag sealing and closing

by Arthur H. Grace

Just as a chain is no stronger than its weakest link, so a bag is no stronger than its closure. Regardless of the strength and protective qualities of the bag body, consideration should be given to the type of closure to ensure adequate protection. While an attempt has been made in the following discussion to list various closures used for bags, it is by no means a complete outline. New developments are constantly changing the picture, and better methods are being found to improve many types of closure. Closures for bags made of transparent film, foil and similar materials are not included in this discussion; for data on these see *Heat-sealing Principles*, p. 558 and *Heat-sealing Equipment*, p. 730.

Some closures are made by hand operations, sometimes with the aid of a machine or tool. Other closures are applied by fully automatic or semiautomatic machines, particularly the pasted and sewed closures.

No attempt is made here to discuss the merits of each individual type of closure. All have their good points; each has its particular place in the field. All closures are not adaptable to all bags. Selection of the closure must be made on the basis of its function, and consideration should be given to the commodity packed and to the protection required. Tight pack, where the bag body is folded down against the product, versus loose pack has a bearing on the style of closure to be used. For example, a machine-sewed closure is loose pack, whereas a pasted closure is usually tight pack.

Aside from cost consideration and volume of production, the points listed below should be considered to determine the most practical closure for the purpose involved. These points are not necessarily listed in the order of their importance.

Protection of contents—Adequate protection of contents is a basic requirement for any package. Not only the body construction but also the closure must protect them from contamination, leakage, penetration, tampering and breakage.

Appearance—Where display is essential, practical consideration should be given to blending the closure into the over-all design. It should add prestige to the package, rather than detract from it.

Opening of closure—It is as important to simplify the opening of the bag as it is to have a secure closure. Anything which can be done to assist the ultimate user in opening the package for use reduces sales resistance. For example, a rip-cord closure which permits opening without tearing or cutting is desirable for textile bags with sewed closures.

Dispensing of contents—The dispensing of the product, partially or in its entirety, should be considered. For paper bags with pasted closures, the Deltaseal type permits the dispensing of granular products by a pouring spout, ingeniously formed by simply cutting the oblique seal in a prescribed manner.

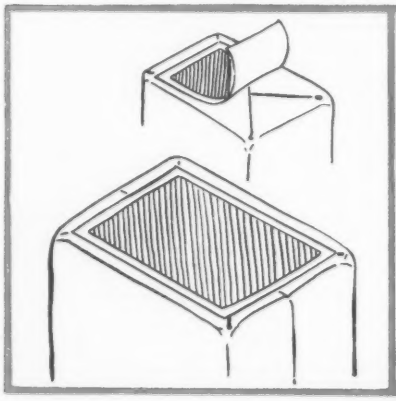
Reclosure—Where partial dispensing is a probability, reclosure is necessary. The tin-tie closure on small paper bags used for such products as coffee packed in the whole bean is an example of this type. The bag is opened for grinding purposes at the point of sale and then reclosed by hand. Wire or ring-tie closures on bags also permit reclosure after partial dispensing.

Stacking—Where the packaged product is warehoused or stacked for display purposes, bag closures vary the stacking process. A loose-pack bag closure, for example, will require more stacking space for some products than a tight-pack pasted paper bag closure.

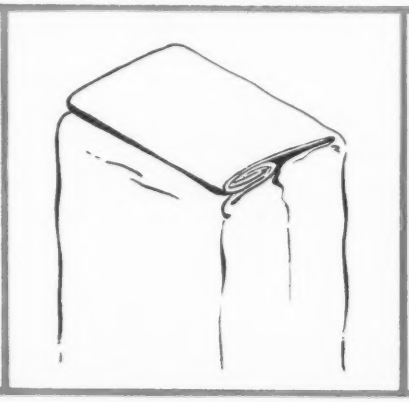
Packing—Packing of paper unit containers in paper shipping balers is another problem for individual con-

The author of this article supervised the preparation of a series of line drawings by means of which the reader may clearly see the details of various bag closing methods. This series, it is believed, represents the most complete information yet collected on the subject. (Ed.)

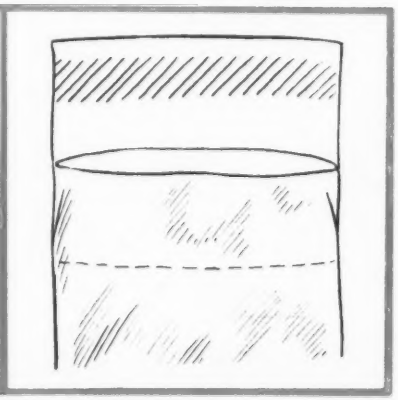
1—Adhesive—oblique fold—with or without label (Hesser).

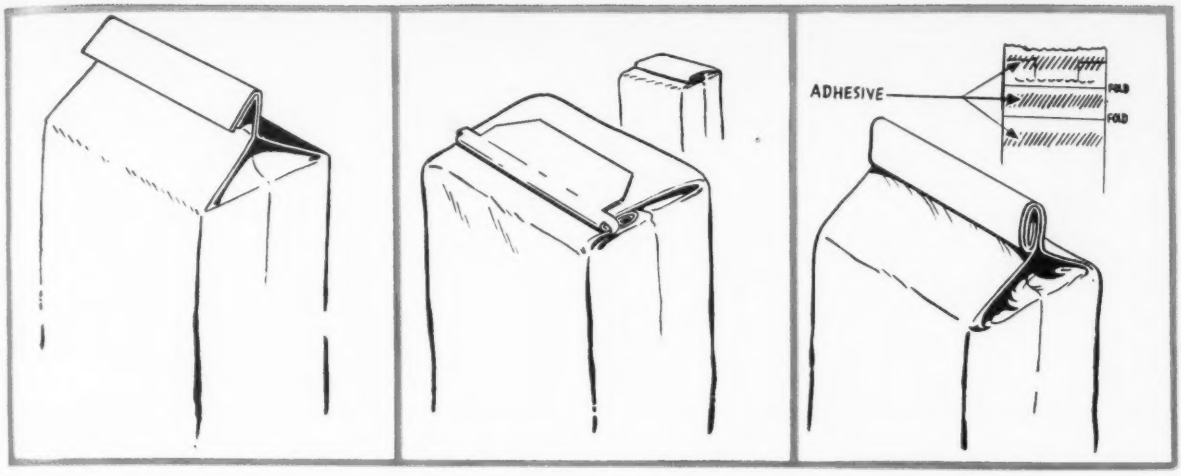


2—Adhesive—rectangular fold—heat sealed or pasted (Sealtite).



3—Adhesive—fold over—lip band—heat sealed.





4—Adhesive—rectangular fold—lip band—heat sealed (Amsco).

5—Adhesive—rectangular fold—with or without tin tie (Benco).

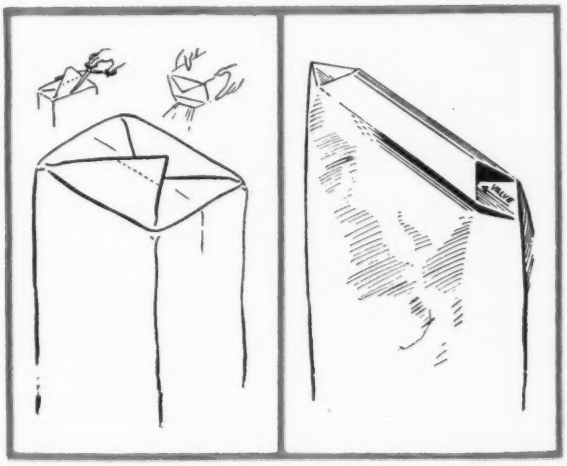
6—Adhesive — rectangular fold — non-sift.

sideration. Where the unit package has a tight-pack closure, a loose-pack closure on the shipping baler will result in shifting in handling and a tendency toward breakage.

Re-use of package—Re-use of containers reached a new high during the war period because of material scarcity, but practical re-use is still important. Cotton bag goods printed with an attractive design can be re-used for household purposes and women's wearing apparel. The re-use of burlap bags has been an established business for many years. This factor should be considered in selecting the closure.

Types of closure

There are three general types of closure: adhesive, cotton and metal. In some cases, combination closures are used, for example, a combination of a metal (staple) and paper (tape) closure, or a combination of a cotton (sewed) and a paper (tape) closure. The illustrations



7—Adhesive — oblique fold (Deltaseal).

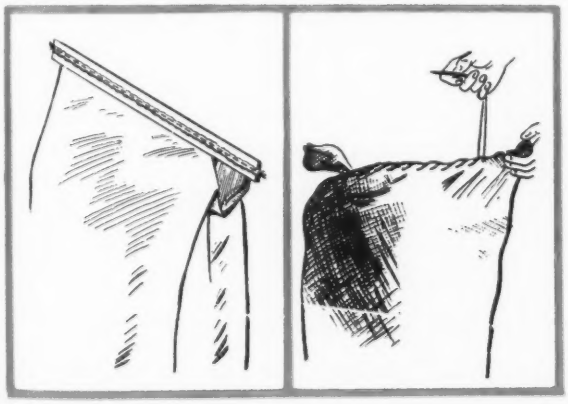
8—Adhesive — oblique fold — pasted valve.

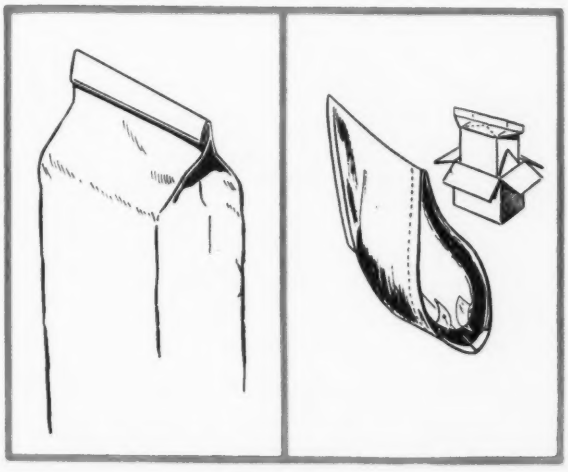
11 — Adhesive — rectangular fold (Amsco).

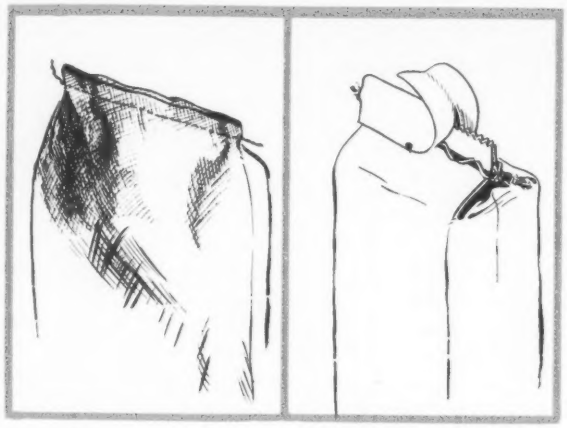
12—Adhesive—no fold —lip band—cold seal.

9—Sewed—no fold —tape bound over.

10—Sewed—no fold—plain seam—hand sewed.

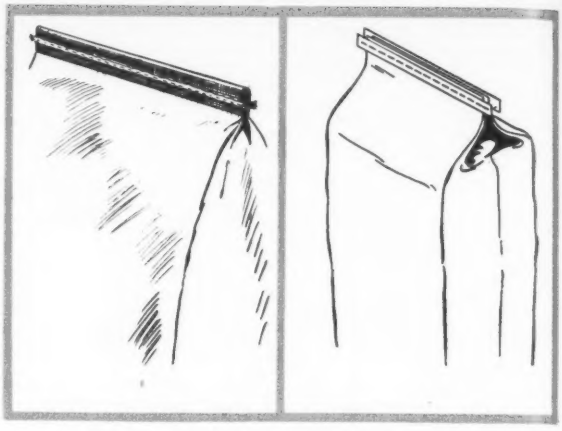






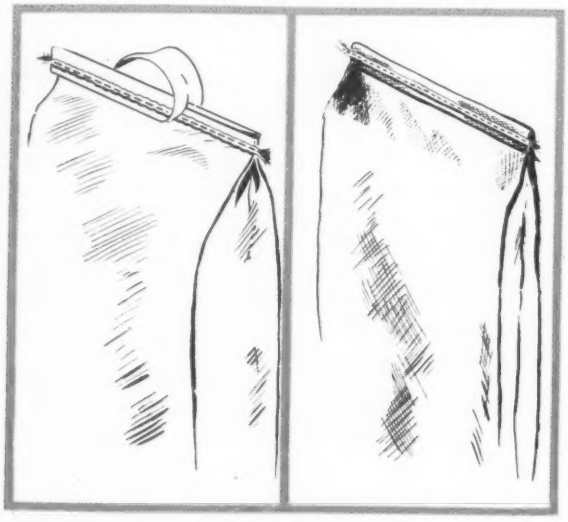
13—Machine sewed—no fold—plain seam.

14—Sewed—no fold—cushion seam.



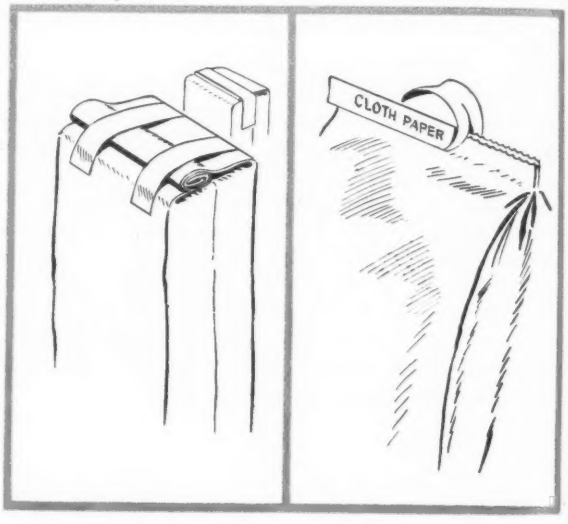
15—Sewed—no fold—cloth tape (Aquatex).

16—Sewed—no fold—plain seam (Dubl-Tape).



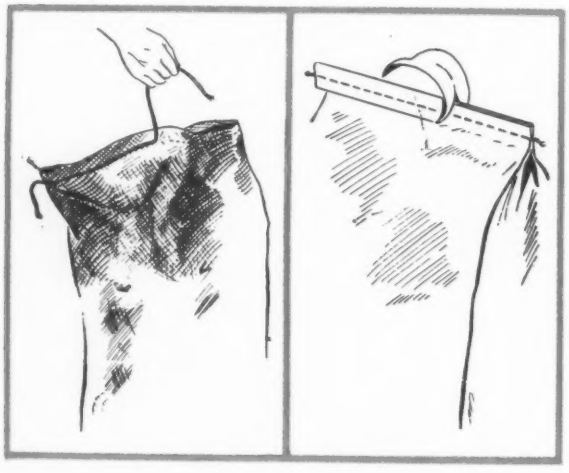
17—Sewed—no fold—filler cord seam.

18—Sewed—fold over—filler cord.



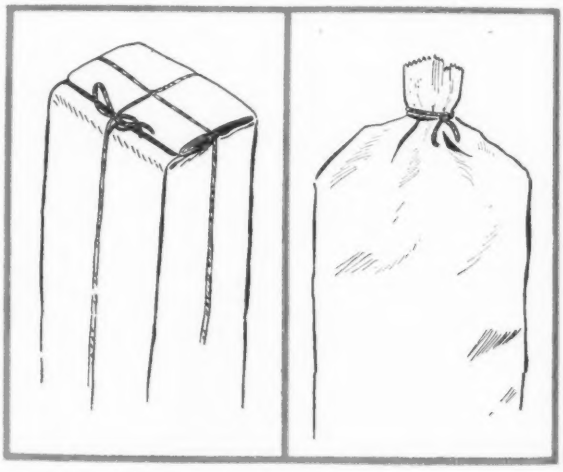
19—Taped — rectangular fold.

20—Taped — paper or cloth—no fold.



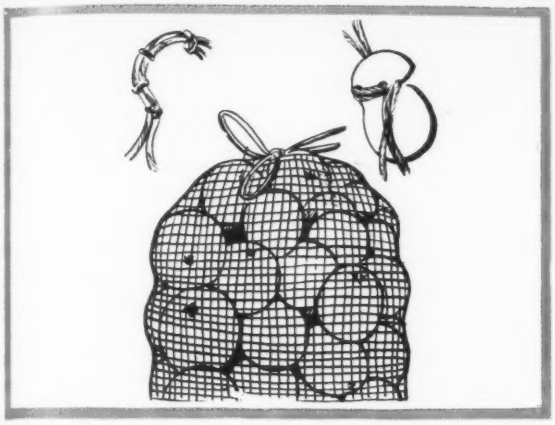
21—Sewed—no fold—rip-cord.

22—Sewed—no fold—plain seam.



23—Tied — rectangular fold.

24—Tied — gathered—no fold.



25—Tied—gathered—draw string—may have seal.

on these pages represent many types of bag closure, described in the captions by the generally accepted trade terminology.

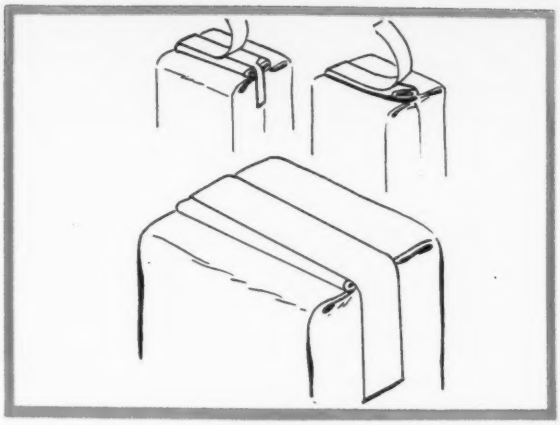
Most bag closures may be described in terms of the bag top: the horizontal or flat top, where the closure has been folded or rolled down; and the vertical top, where the bag closure remains in a more or less upright position, even though the top may be flattened somewhat in case packing. The effectiveness of the closing operation itself has been the determining factor.

Details about hand and automatic equipment for bag sealing and closing are given in the articles on pp. 728 and 754 of this volume. Therefore no attempt has been made to describe them here. Where closure is automatic, several different machines may be used to perform the same function, particularly in the case of stitched closures.

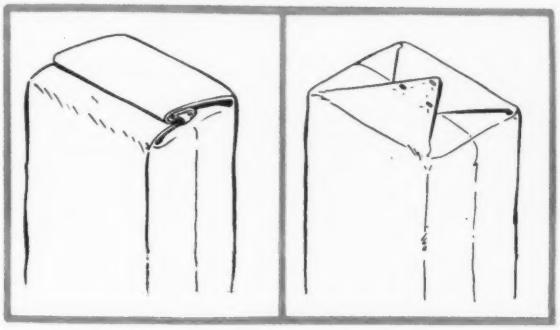
Small paper bag units—A distinction should be made between so-called complete bag-making units and closure equipment. The complete unit machine for paper bags forms the bag from the roll and/or sheet of paper, carries the bag through the feeding and filling machine and then forms the closure, which is the final step in the operation.

Closure machines or operations are based on preformed bags, manufactured in a separate operation and closed after the filling process.

Closure machines for this purpose are limited to bags of small capacity, usually of the 1-lb. size. There are

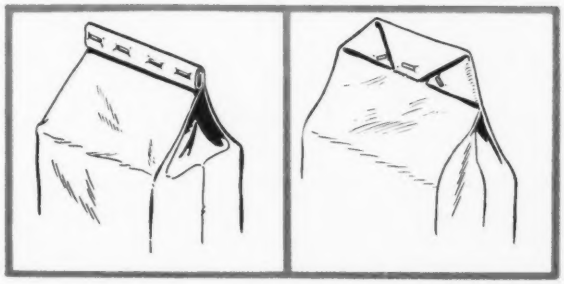


26—Stapled—oblique fold (Deltagrip).



27—Stapled — rectangular fold (Saranac).

28—Stapled — rectangular fold.

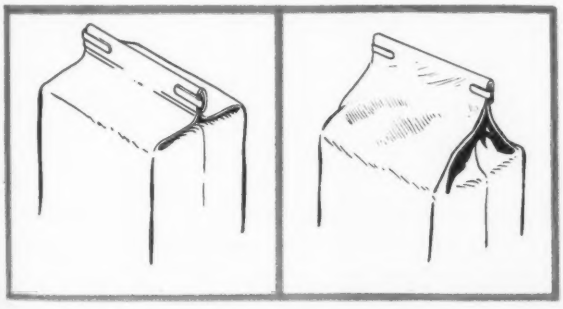


29—Stapled — rectangular fold.

30—Stapled — triangular fold.

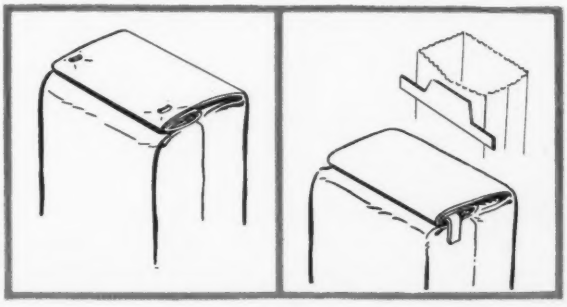
31—Tin tied—rectangular fold—raised center (Hesser).

32—Tin tied — rectangular fold (Pneumatic).

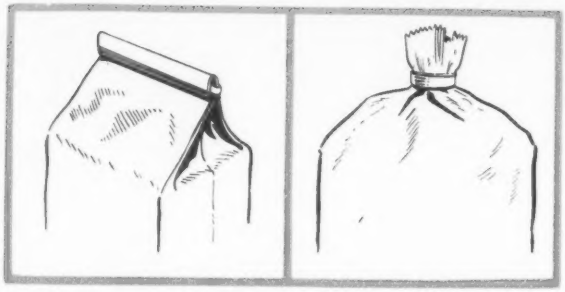


33—Tin tied — rectangular fold (Allison).

34—Tin-tie primary or reclosure—rectangular fold (Seal Tye).

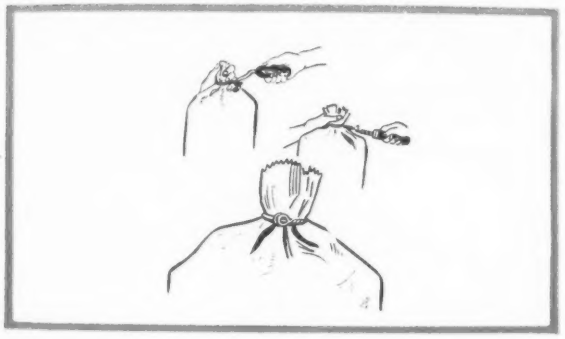


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35—Tin tied—rectangular roll (Hesser).

36—Ring tied—no fold (Minneapolis).



37—Wire tied—no fold—gathered (Bates).

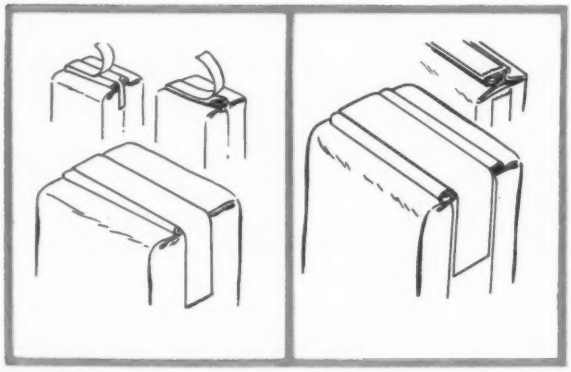
two types of complete unit—the Hesser (German patent), and Pneumatic (U. S. patent). Both make tin-tie closures used for coffee, but adapted to other products.

Small paper bag closures (factory made)—Small paper bags, either single-ply or duplex, range in capacity from fractional pounds to about 25 pounds. Multiwall bags are generally used for products packed in larger quantities which, therefore, are of greater weight.

Adhesive, cotton and metal closures are all adapted to the small paper bag. The amount of production in this particular field is by far the largest, and closures of varying types are used.

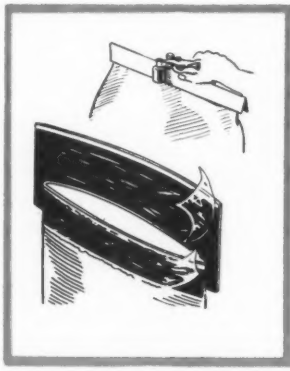
Because of the large volume of packaging involved in a great many commodities, particularly for food products, automatic machines have been developed for closure purposes. On the fully automatic closure machines, empty bags are stacked by hand in the loading magazine, automatically opened, filled and closed in one continuous operation. Other machines simply apply the closure after the filling operation, which may be automatic or manual or a combination of the two.

Baler and multiwall bag closures—Sewed closures are generally used on multiwall bags. Combination closures of sewed cotton thread and paper tape are used where stronger closure is required and additional protection desired. When manufactured by automatic equipment, this is the ideal closure because a saving in

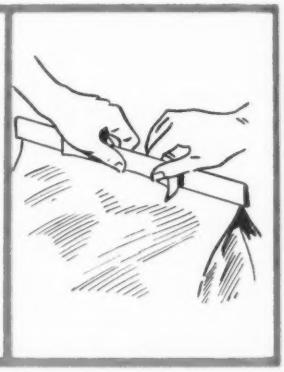


38—Taped — rectangular fold—may have tin tie (Allison).

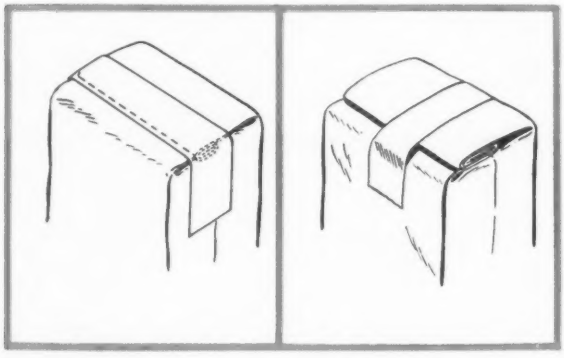
39—Taped — paper or cloth—rectangular fold (Arenco).



40—Taped—tape half-attached—cold sealed—lip band adhesive.

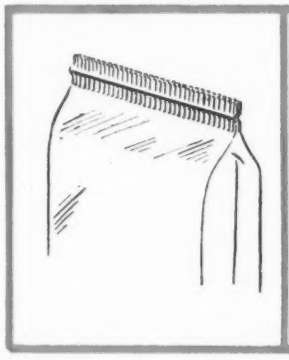


41—Taped—paper or cloth—no fold—glued slit top.

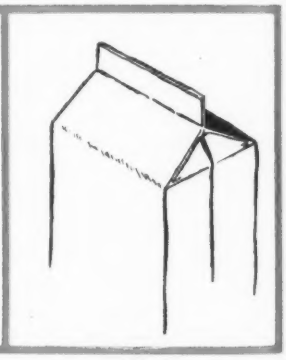


42—Taped — rectangular fold (Gold Medal).

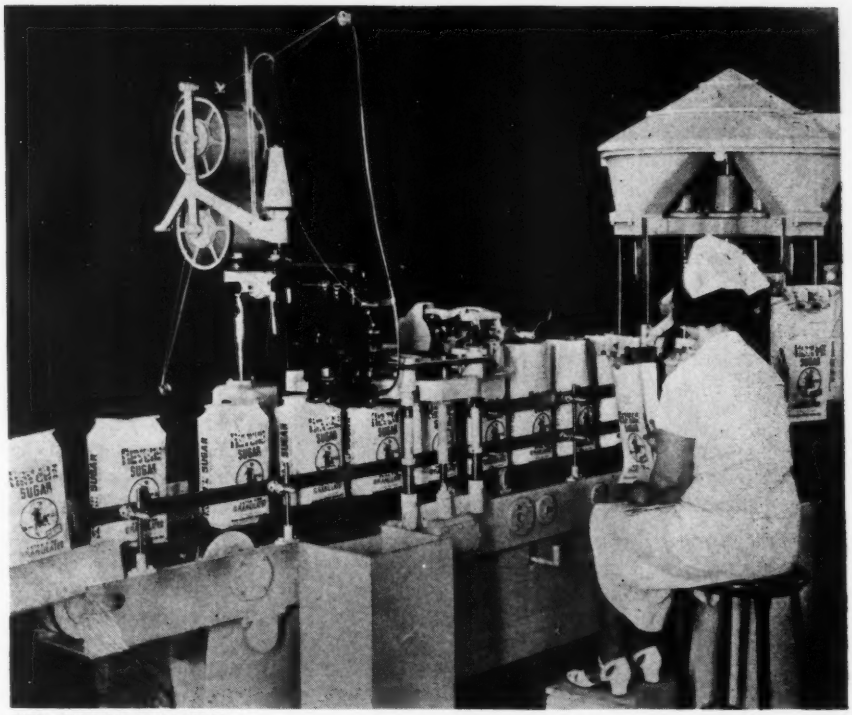
43—Taped — rectangular fold (Tape-O-Matic).



44—Adhesive — lip band (Therm-O-Top).



45—Adhesive—no fold—duplex liner.



PHOTO, COURTESY ST. REGIS PAPER CO.

46—These rotary filling and closing machines apply sewed tops to 5-lb. sugar bags at the rate of 30 to 40 bags per minute.

the length of the bag, as compared with the tied closure, is effected. The filler cord, if it is used, may be of either cotton or paper. Valved closures, either pasted or sewed, with or without the tuck-in sleeve, are satisfactory for free-flowing products.

Sometimes the tape is offset-sewed at the corner of the multiwall bag, to be closed, after filling, by stapling or sewing. Taped ends may be wax-dipped to prevent penetration or seepage. In the case of the Aquatex closure, a cloth tape is used which absorbs the wax, ensuring absolute protection. The paper tape may be natural or colored, smooth or crinkled, plain or printed, varying in basic weight to meet the needs of the bag.

Tied closures, both wire-tie and twine-tie, are also quite generally used. They are generally applied by hand while metal ring-ties can be automatically applied. Stapled closures may be used in some instances, although the folding over at the top of the bag, plus the heavy body construction usually used, result in a ply thickness which is rather difficult to handle. Tape closures, glued or gummed, are applied entirely by hand.

Baler closures are limited, more or less, to two types: pasted and sewed. Pasted closures are made by hand, the sewed types by machine.

Textile bags (burlap, cotton and open-mesh)—Cotton



47—Flour bags are shown in a range of sizes. These bags have various types of closure, including among them ring tied, stitched and pasted closures.

XUM



PHOTO, COURTESY BEMIS BRO. BAG CO.

48—An illustration of the manner in which seamless cotton bags are filled and closed in seed warehouse.

thread closures, sewed either by hand or machine, are generally used on burlap or cotton bags. When paper liners are used for granular products, the liner can be pasted and the cloth bag sewed. Sometimes both are sewed in one operation.

Open-mesh bags, either cotton or paper, can be closed by hand or machine sewing, or by a drawstring closure. The drawstring closure can be tied or secured by a metal clip or band. For the latter operation, special stapling machines are available, or the closure may be locked by a pressed paper seal.

Laminated bags, textile and paper—This type of bag is usually constructed for protective purposes. Therefore the closure should protect the contents to the same extent as the bag body. Laminated bags usually carry approximately 100 lb. of the product packaged. Because this bag material is more expensive than either textile or paper, closures are used which minimize the size of the bag and yet are strong enough to carry the load. Latex adhesive tape seal closures, bound over, are most practical.

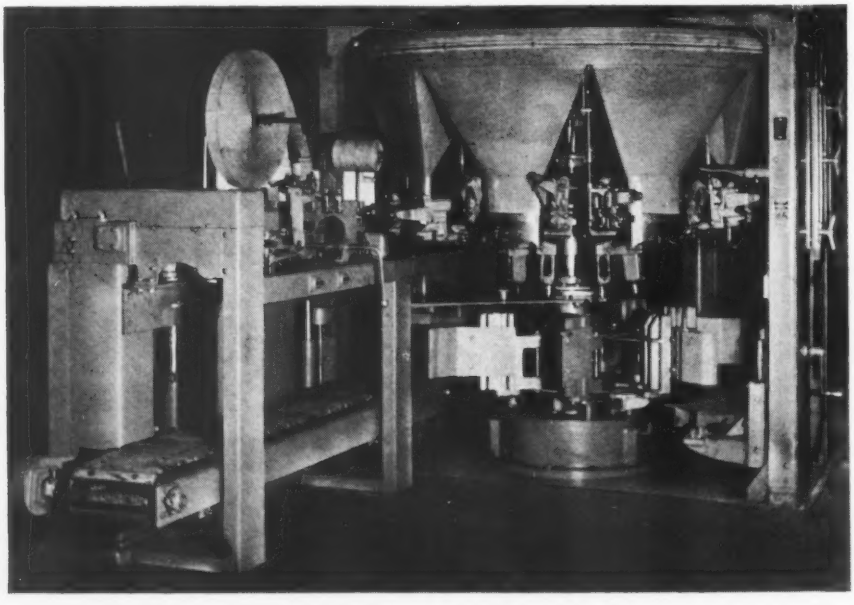
Closure tape is usually laminated of the same material as the bag body, although it is practical in some cases to use other types of tape. A variety of tape closures may be employed; for example, the slit tape top, the half-attached tape or tape which is applied at the time of closure.

Sewed closures are used where needle holes are not a detriment. However, filler cord or some other substance can be used to close up the openings when necessary. In some cases, metal closures—stapled or tied—are practical, but they are not generally used.

Paper case liners—During the war, paper case liners were found to be good for protective purposes. The most generally used closure for this type of bag is the cold pressure seal. With this method, asphaltum is applied at the bag factory as a lip or band seal inside the bag, or to a paper tape which is half-attached to the top of the bag. A cellophane protective strip is then placed over the asphaltum band seal, and is removed when ready for sealing. Closure is effected by means of pressure between knurled rollers which may be either motor-driven or hand-operated.

Closure, of course, can also be accomplished by folding down the top of the bag and applying paste or glue, but such a closure does not give maximum protection.

PHOTO, COURTESY BAGPAK, INC.



49—Open-mouth, multiwall paper bags can be filled and sealed at high speeds on this rotary equipment; a modified model is available for flexible bags.

ADVERTISING FOR

BAGS—
ENVELOPES—
PACKETS

Bemis Accepts The Responsibility

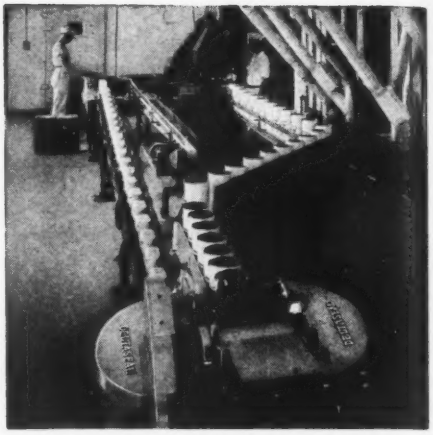
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When You Use the Bemis Deltaseal System of Packaging

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Now, from *one* company you can get *all* the elements of a complete packaging service. The Bemis Deltaseal System of Packaging has proved the way to increased sales, lower packaging costs for manufacturers whose products are sold in powdered or granular form.

Look at these three basic packaging functions for which Bemis takes the responsibility.



1. **Deltaseal Bag Closing Machinery**—Designed by Bemis packaging specialists.



2. **Service**—Bemis specialists assist you by making timely suggestions for new efficiency on your packaging lines.





3. **Bags**—The Bemis Deltaseal Bag, colorfully printed with your brand, gives you the Deltaseal feature, the "easy pour" spout that has won enthusiastic consumer acceptance and is equally popular with your trade.

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SYSTEM OF PACKAGING

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CALL YOUR BEMIS REPRESENTATIVE TODAY. THERE IS NO OBLIGATION.

transparent bags

HELP PROMOTE MANY MERCHANDISING IDEAS



Ready-to-cook-or-serve fruits, vegetables, salad greens are irresistible to the shopper when packaged in Lumarith. Lumarith is a plastic film that offers protection and visibility at all times—remains crisp and crystal clear, and won't wilt or fog under refrigeration.

Lumarith is versatile—ideal for dried foods, stationery, greeting cards, dry goods, bags for interplant shipment of parts, window envelopes . . .

Let us sit in on your packaging problems. Celanese Plastics Corporation, a division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y.

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LUMARITH*

A Celanese® Plastic

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PAGES 192-3, 482-3, 669

WRITE FOR PACKAGING BOOKLET

made of DU PONT Cellophane

- Brushes
- Belts
- Beads
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- Negatives (Photo)
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- Orangewood Sticks
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TRADE MARK REG.
Pouches

THIS list shows only a few of the many products which are successfully and economically packaged in "HUMITUBE" pouches.

These original crimped end containers have taken thousands of such small items to market for fast, visible selling—amply protected.

As pioneer converters of DuPont Cellophane, and leaders in the small package field, we invite your inquiries.

A full line of flat, square and satchel bottom bags, plain or printed, is also available.

HUMITUBE MFG. CO.
PEORIA 3, ILLINOIS



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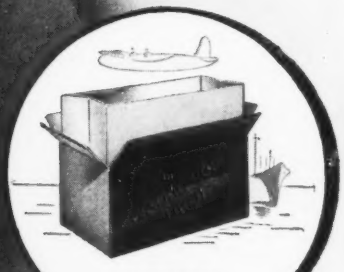
AUTOMATIC BAGS



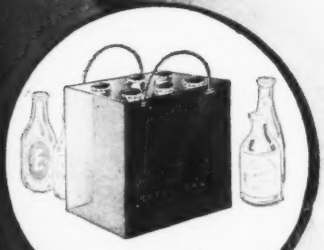
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MULTIWALL SHIPPING SACKS



WATERPROOF BOX LINERS



AUTOMATIC BOTTLE BAGS



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EQUITABLE has *the Know-How* in BAG PACKAGING

EQUITABLE Paper Bag Company, Inc. has pioneered in solving every conceivable type of packaging problem for more than 25 years.

Our boundless resources and unlimited *know-how* came in mighty handy during the war years when trustworthy "substitutes" had to be found for scarcer packaging materials.

Many of the packaging developments, born of wartime necessity, will be adopted by civilian industry because their outstanding features offer a definite improvement over oldtime packaging methods. These improvements include bags made of sift-proof and moisture-vapor resistant papers, in new, rugged, fool-proof styles that insure product protection and merchandising appeal.

Because packaging with Paper Bags results in savings that are tremendous when compared with other methods, many farsighted firms will count on EQUITABLE Paper Bags to solve packaging problems in the days of "good old-fashioned competition" to come.

EQUITABLE Paper Bag Company, Inc. will continue to pioneer in the solution of protective packaging problems. Consult an EQUITABLE packaging expert for further details.

Equitable

PAPER BAG COMPANY INC

Mills at: Orange, Texas

47-00 THIRTY-FIRST PLACE • LONG ISLAND CITY, N. Y.





HE'S READY TO SERVE YOU WITH *Transparent Containers*

Bags and envelopes made of the latest transparent materials now released from war. All standard types and sizes or tailored to your packaging needs . . .

You benefit because U. S. E. Protective Packaging has many years of prewar successful experience plus the know-how gained in four years of packaging for war . . .

No question about material, strength, seams, sealing, printing in full color: The Kellogg Man is ready to work with you for full protection, maximum sales-building eye appeal, and rapid and economical production.

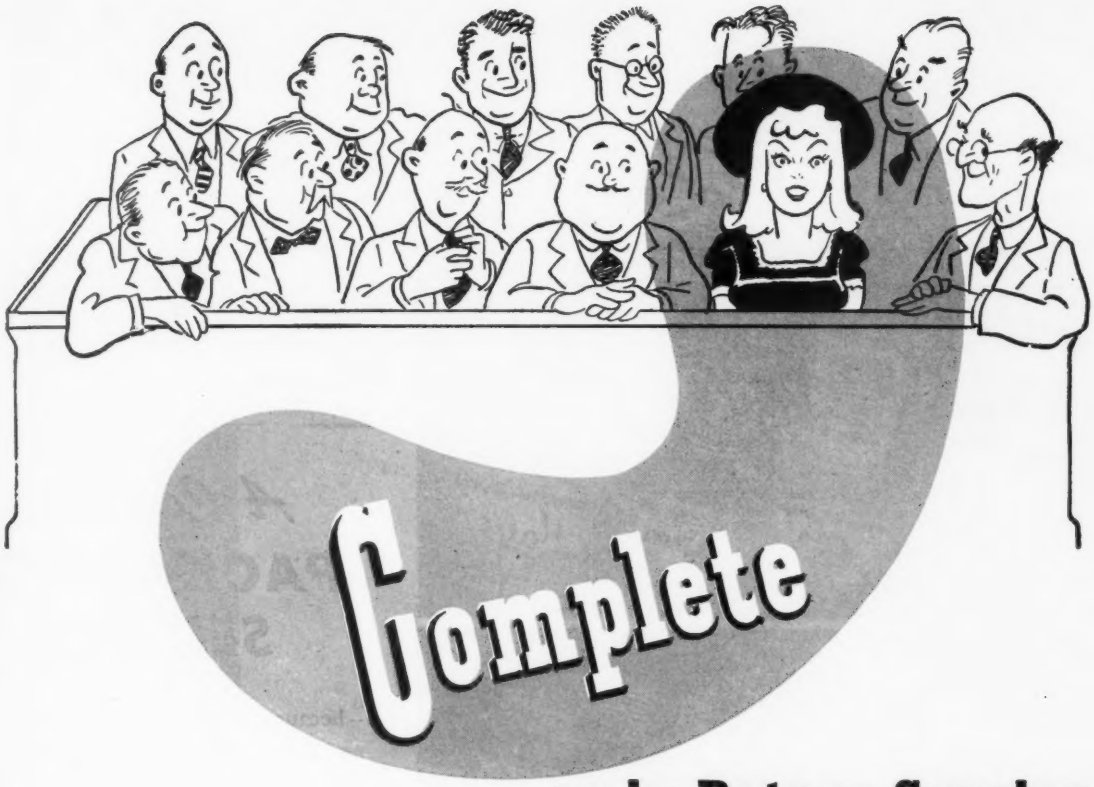
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14 Divisions from Coast to Coast

U·S·E PROTECTIVE PACKAGING

K KELLOGG CONTAINER DIVISION SPRINGFIELD MASS.



Complete

...as in Betner Service

Yes, sir, it's a *complete* packaging service that Betner gives—from idea to finished bag.

And available to you, all or part.

Is it frozen foods you're interested in? Or containers for retail or institutional use? Leading firms have found their answer in Betner Bags.

For frozen foods, coffee, cereals, flour mixes, powdered and dehydrated foods, etc., nothing has come along more satisfactory to progressive processors than Betner Bags. They want quick fill-and-seal, top moisture-vapor protection, a minimum of packaging equipment. They demand insurance against leakage, seepage, loss of flavor. They get 'em all with Betner Thermoseal and Lamofilm Bags.

A complete bag service is on call here. Idea men, art staff, printing presses, bag-making machinery at your command—or any part thereof. Write us about your problem, present or postwar.

Benj C Betner Co

DEVON, PA.

Benj C Betner Co of California, Los Angeles, Cal.



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Under One Roof









A Complete PACKAGING SERVICE

—because Cupples-Hesse Corporation manufactures diversified paper products you can be sure their recommendation for your package will be one that has duly considered *all types* of paper packages—their merits and demerits. The photographs show only a few of the Cups, Bags, and Envelopes that have been employed to complete satisfaction by companies operating locally or on a national distribution basis.

Send your package problem to Packaging Division.

Cupples-Hesse CORPORATION
MANUFACTURERS — PAPER PRODUCTS
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ST. LOUIS 15, MISSOURI

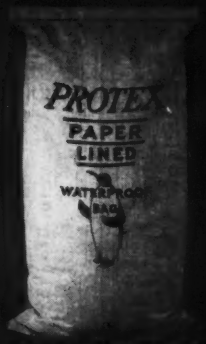


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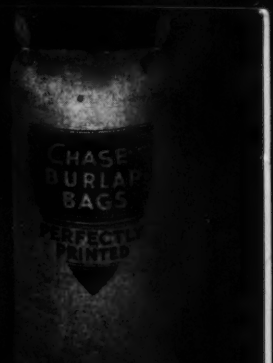
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INCLUDING OSNABURG
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WATER & MOISTURE-PROOF
BAGS OF MANY STYLES
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2-3-4 OR 5 PLY PASTED
OR SEWED BOTTOMS
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COMPLETE ARRAY OF
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MANY SIZES, COLORS
AND TYPES FOR FRUIT
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Year In AND *Year Out* CHASE MAKES THE BAGS YOU NEED

Through 99 years of bag making, through wartime and peacetime, Chase has learned how to produce the bags you need.

Using cotton textiles, burlaps and papers singly or in combinations, Chase engineers have designed an endless variety of specialized containers—specially treated hybrid corn seed bags, laminated water proof bags, open mesh produce bags, film mailers, popcorn bags and a whole host of other specialized products to say nothing of a great array of standard bags.

Whatever your bag needs may be, it pays to line up with Chase. Write or phone your nearest Chase office today.

CHASE BAG CO.

General Sales Offices, 309 West Jackson Blvd., Chicago 6, Ill.

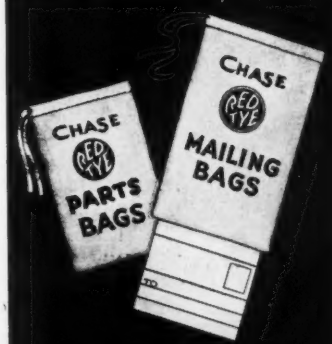
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SUGAR, SALT AND OTHER
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LINERS FOR BAGS,
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SMALL BAGS FOR PARTS,
DESICCANTS AND MAILING
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Coast to Coast Bag Service

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America's Oldest Bag Manufacturers

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Sewn Containers



If your product is made of materials which might be damaged by the rigors of handling and shipping—such as metals, plastics or glass—it is very likely that a SEWN CONTAINER by COTTONLUXE will insure its safe arrival into the hands of the consumer and add that touch of quality to its packaging and appearance which so often clinches the sale.

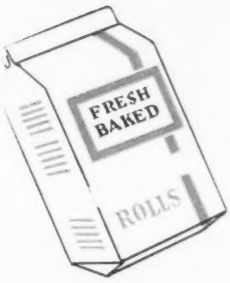
The bags, envelopes, pouches and cases which we design to contain almost any type of product have a definite, proven sales appeal.

Shortages of some materials—especially textiles—have been hampering our production to some extent, but we expect these materials will be in normal supply in the near future. In the meanwhile, with SEWN CONTAINERS in greater demand than ever before, we are doing our utmost, in spite of the many problems which we face in common with other industries, to supply the needs of our customers and to expand production to the point where all requirements will be fulfilled.

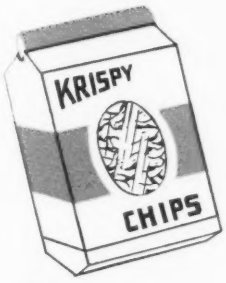
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NEW YORK, N. Y.



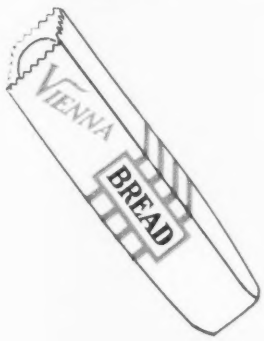
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THE NAME THAT MEANS *All That's Best* . . . IN PROTECTIVE PACKAGING



Talent to fashion packaging materials into safe carriers with maximum sales appeal for your products; and **complete facilities** for producing them in the shortest possible time, at the lowest possible cost . . . these are important reasons why **Kehr** is the **buy-word** among the Nations' largest users of paper, glassine, foil cellophane and transparent bags.

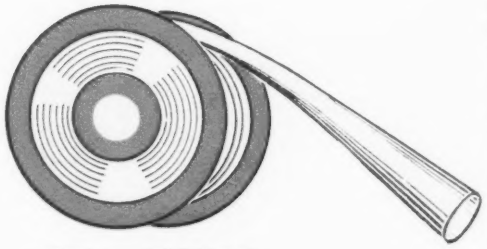


No matter what product you make . . . from buns to bearings . . . you will find the sound, **economical** solution to your packaging problem in a Kehr carrier, designed for protection alone, or protection **plus** sales influence.

Your inquiries will receive immediate attention, and you can count on prompt, efficient cooperation on small or long-run orders.

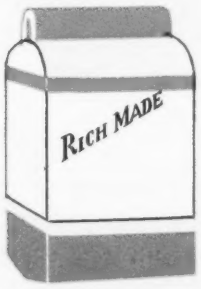
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Continuous Roll Tubing of Transparent Film, Foil or Paper.

Our Development and Design Department is available for the creation of new **sales**-appeal packaging for every commodity. Combining the practical with the artistic is a quality that lends distinction to every Kehr-produced container.



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BAKELITE
TRADE-MARK

Wherever plastics are known and used, the trade-mark "Bakelite" is a mark of quality, performance and progress.

Bakelite Corporation, a Unit of Union Carbide and Carbon Corporation, is a pioneer in the field of plastics. Leo H. Baekeland, who discovered the first synthetic *thermosetting* plastics, founded this leader in the plastics industry. Today, Bakelite Corporation is noted not only for thermosetting plastics—phenolics and ureas—but also for thermoplastics—vinyls, polystyrenes, and polyethylene.

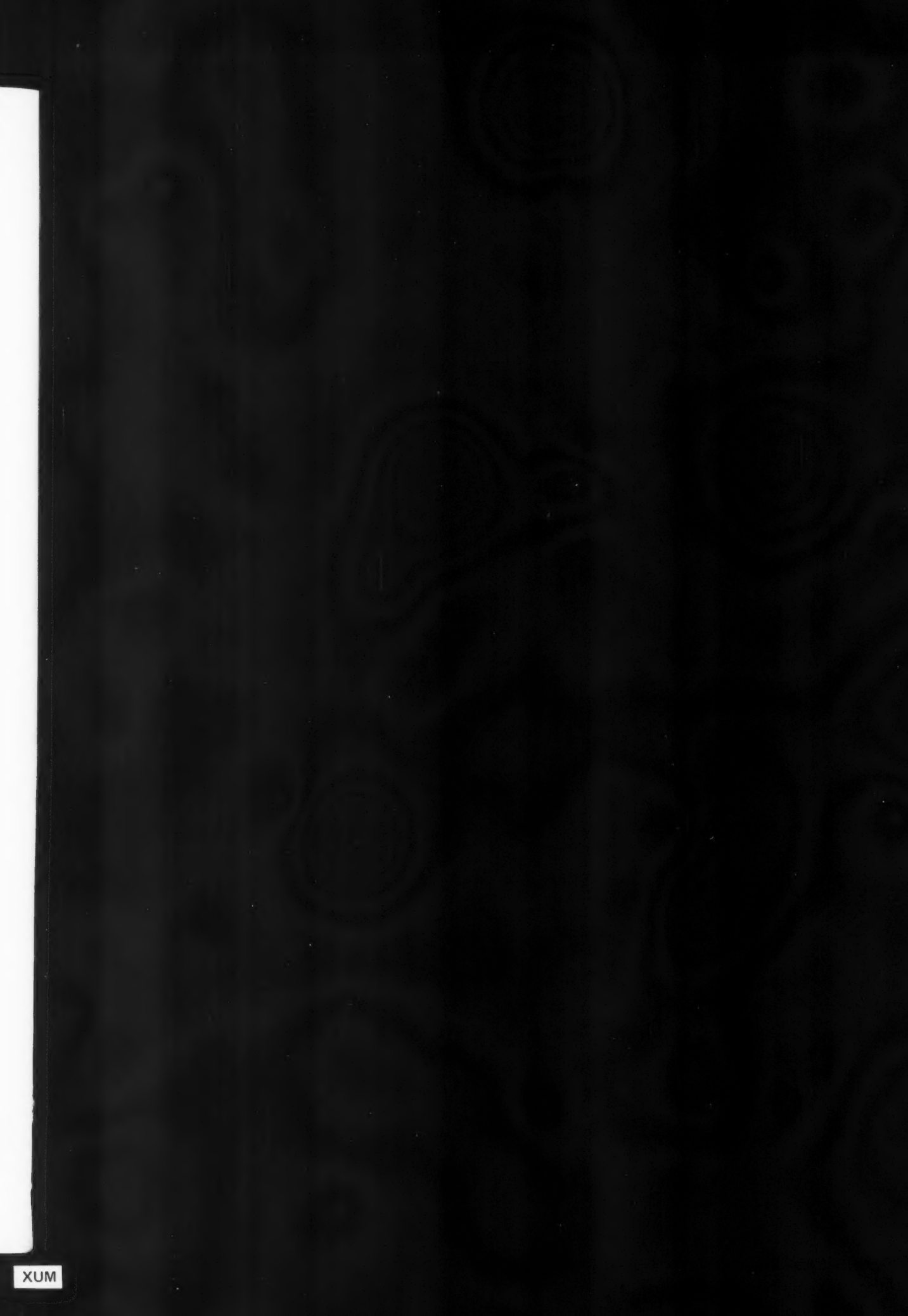
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MODERN PACKAGING

For fifty-one years Royal has been creating and designing flexible containers in bag and envelope form. If your product needs the protection of such films as Pliofilm, Cellophane, metal foils, glassine and greaseproof or laminated materials such as our Royalflex films, our art and package designing departments can help you create beautiful and efficient containers made from any of those protective materials.

Royal bags, envelopes and wraps are used not only throughout the United States but all over the world as well and a Royal flexible package is "Always Outside Evidence of Inside Quality".

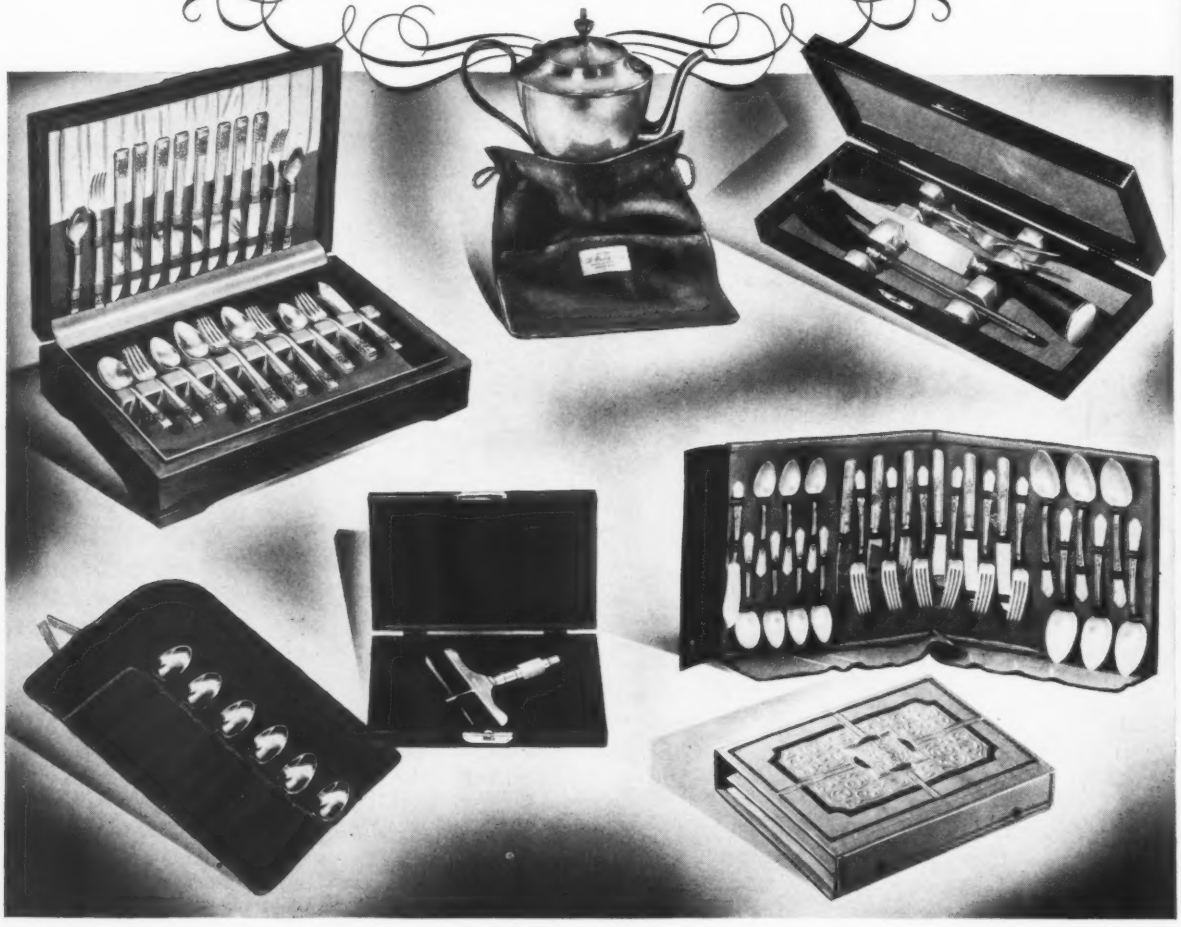
***"FLAV-O-TAINER"*— Royal's patented duplex flexible container made with heavy paper outside and an inside liner completely heat sealed on all seams. Flav-O-tainer may be lined with Pliofilm, Cellophane or any other thermoplastic film, thereby making it adaptable to all products whose quality demands absolute protection from air or moisture.**

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Eureka Manufacturing Company is a designer and manufacturer of the finest type luxury containers, and supplies the silver flatware industry with a sizeable portion of the Silverware Cases used.

In addition a variety of industries such as cutlery, smokers' accessories, fishing equipment and others use Eureka bags, pouches and cases to protect their quality products and to package them in the fine containers they deserve.

EUREKA *Manufacturing Company, Incorporated*

TAUNTON, MASS.

SHE DIDN'T KNOW WHAT KIND OF BAG IT WAS

She knows it DIDN'T LEAK



"SUPER-SEAL"

Cellophane bags assure the packer of the utmost protection, being both leak-proof and sift-proof.

We specialize in the converting and printing of Cellophane bags where performance above the average is desired.

THE Munson BAG COMPANY

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CONVERTERS • PRINTERS OF CELLOPHANE • FOILS • ROLL STOCK • SPECIAL SHEETS

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- Amkleer Cellophane Bags and Envelopes. Special prints and sizes as well as all stock sizes — printed or plain. Bags in flat, square or satchel-bottom styles.

- Glassine Bags and Envelopes. Serrated-edge bags and die-cut envelopes in special prints and sizes as well as all stock sizes — printed or plain — of special papers or standard glassines. Bags — waxed or unwaxed.

- Envelopes. Open end, coin or Kensington clasp. Special prints and sizes as well as all stock sizes — printed or plain — in special papers or regular grades.

Our staff includes competent representatives experienced in handling the difficult or unusual packaging problem. They'll be glad to assist you at all times.

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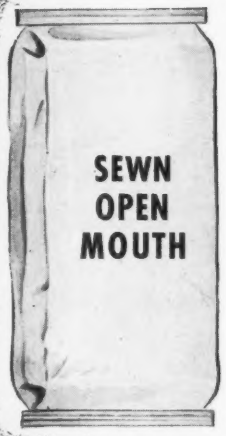
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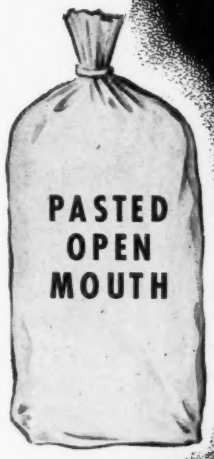
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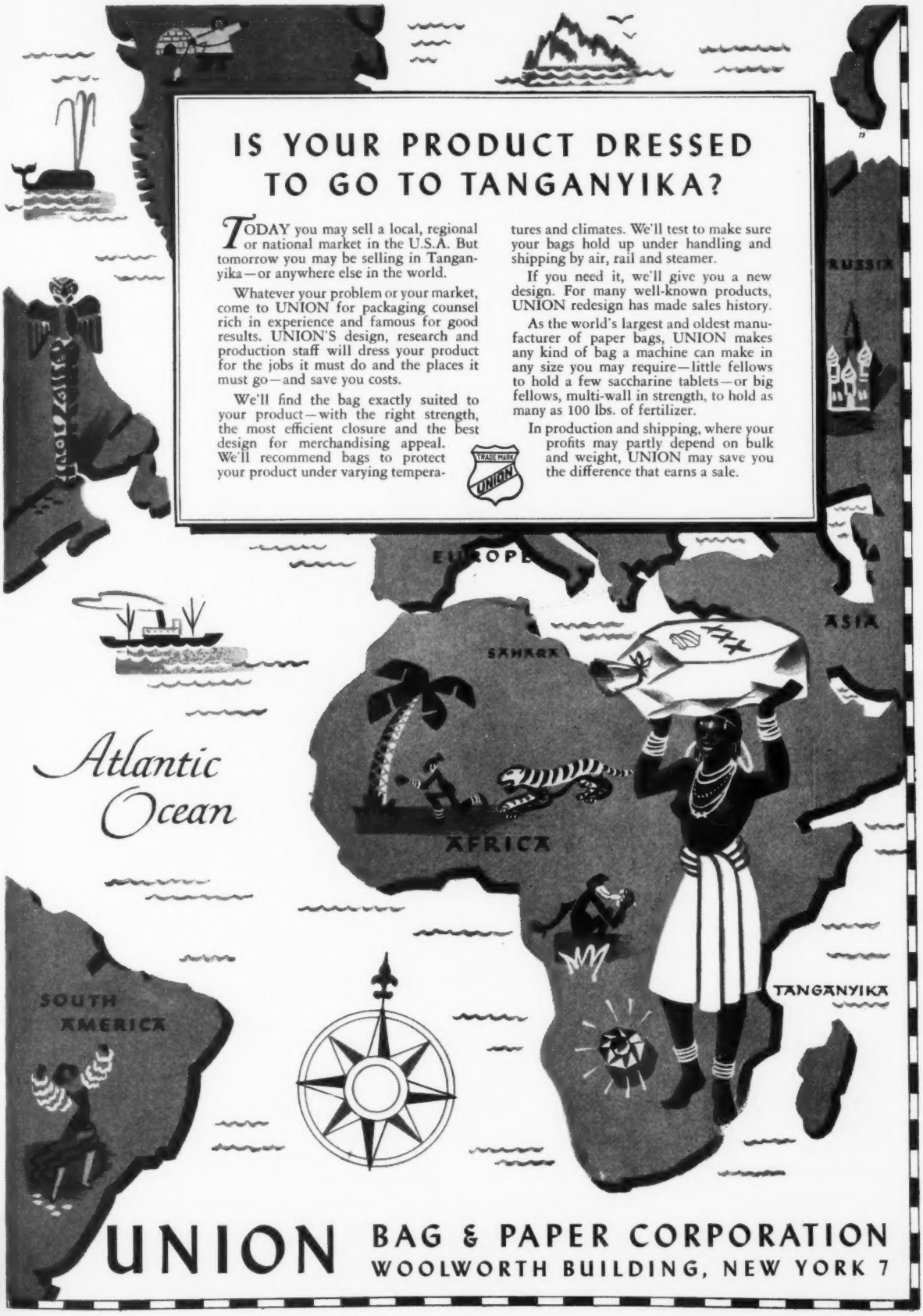
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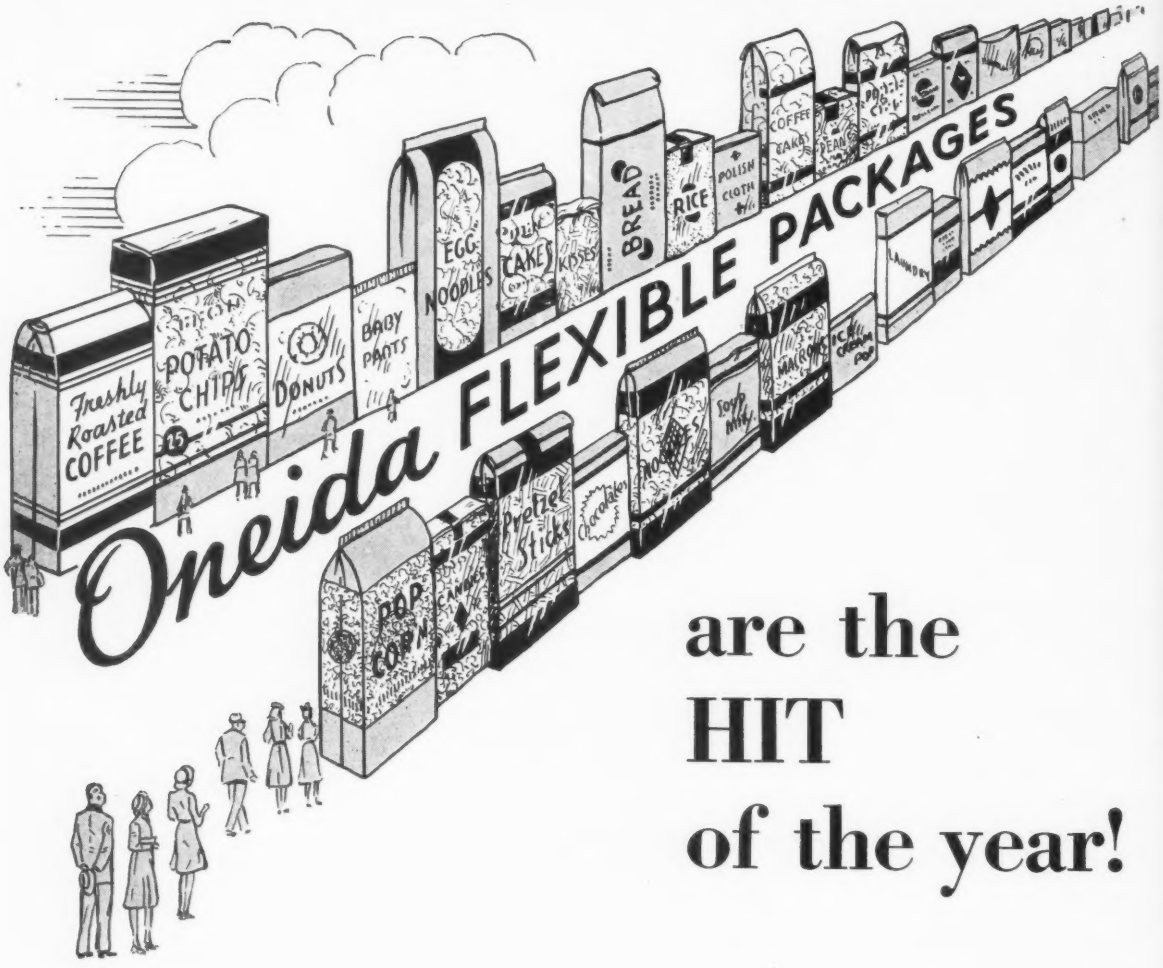
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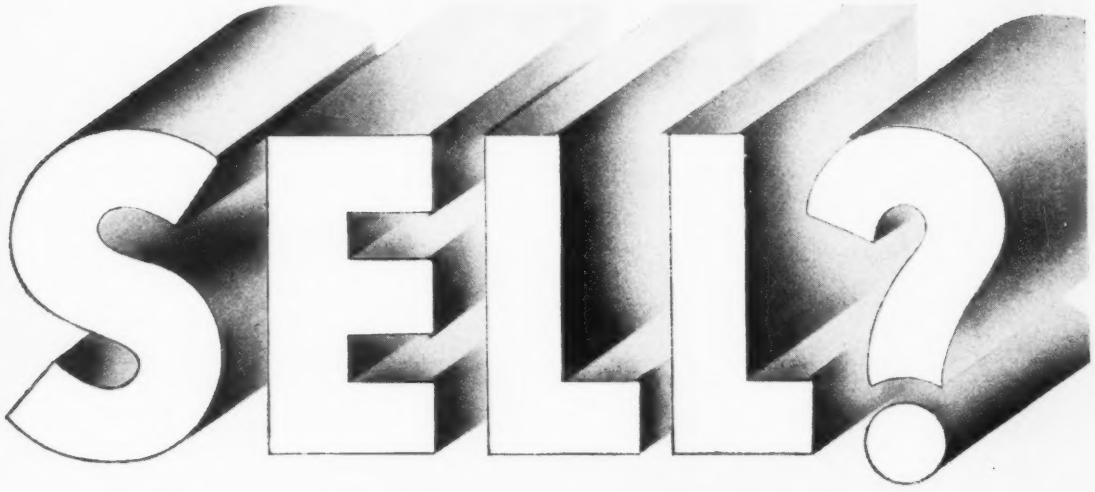
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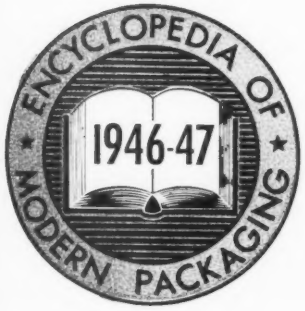
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LABELS—SEALS—TAGS—MARKING PIECES

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Labels-Tags-Seals
Page 287

XUM

Labels—seals—tags—marking pieces

by Charles R. Cosby

Little books were popular in Caesar's time just as they are today, but in Rome the little books were *libelli*, the diminutive plural of *liber* (book), and were used on the placards carried about the streets displaying abbreviated announcements or proclamations having "news" interest. It is not difficult to trace the analogy between *libelli* and labels. It remained for modern language to apply the word in a metaphoric sense to persons, meaning to place a person in a definite category, as if actually emblazoned in bold and unmistakable characters. For example, a person who is said to bear a party label is thereby classified and identified. Language and meaning have reached maturity when the words to describe the commonplace things like the markings of early pottery have become, through the centuries, appropriate to describe the qualities and distinguishing characteristics of human beings.

It is now known that labeling was one of the primitive steps in the art of writing. The earliest practice of the use of markings for the purpose of conveying intelligence was found among the excavations of Sumerian habitations in Mesopotamia, a civilization dated between the years 3500 and 2900 B.C.

The origin of labeling

The markings practiced by the Sumerians were made by seals or cylinders bearing the peculiar and distinctive mark of the owner. These were the first assertions of property rights—they were the evidence of ownership. Naturally they were placed on objects of value which, as they passed from one generation to another or from hand to hand in exchange for other objects of value, came to be esteemed as marks of authenticity. Their value depended upon the honor and prestige of the mark.

As commerce and trade developed between nearby communities, a medium of exchange or currency was developed. The objects used for this purpose had an intrinsic value, expressed according to weight and fineness—a practice which established as currency familiar pieces of metal or other rare substances bearing weight designations and the mark of the weigher. The validity of the piece and the mark of the issuer spoke for themselves.

It was unnecessary to provide names for the pieces used as currency, although, in the course of time, things began to have names, represented by certain marks which eventually became letters of the alphabet.

Commerce and the exchange of commodities made it necessary for goods to have marks of origin. Methods of packing made it necessary for containers to have marks of contents. That system was adopted for trade among dealers, as distinguished from consumers. Measured by the yardstick of time and history, the art of packaging for consumer distribution is of very recent origin. Despite its newness, packaging has been made possible by utilizing one of the oldest methods of communicating human intelligence, namely, the marking of goods in order to establish their identity and absolute authenticity.

NOTE: Most of the illustrations in this chapter indicate by code marks the label manufacturers to whom credit is due for assistance in supplying appropriate illustrations. This code is explained on page 306B.



1—Labeling is an evolution which began with a crude type of tag—a far cry from the varied colorful and embossed labels, seals and tags found on merchandise in retail stores. Illustration shows types of label to be found in a drug outlet, including tobacco products, toiletries, pharmaceuticals of "ethical" character. Materials vary from one color type to embossed metallized seals or colorful transparent decalcomanias.

Within the memory of persons now living, it was the general practice to dispense goods from bulk containers into receptacles furnished by the customer. Such products as prunes, sugar, crackers, candy and other foodstuffs were wholesaled in bulk to retail dealers, who scooped, weighed and sometimes packaged each customer's orders as and when they were wanted. In those days, time was something which everybody had plenty of, the neighborhood store was a comfortable spot in which to kill time and swap gossip, and nobody was bothered with new-fangled notions about germs, sanitation and efficiency.

Nevertheless, there was no moratorium on ideas. The enterprising jobber's salesman was smart enough to discover that he could write bigger orders if he always sold some paper bags with each lot of bulk prunes and each keg of hard candy. Even the storekeeper found that his spare time could be used to tie up packages in anticipation of the next day's sales. He noticed that every commodity has a natural order size for consumer use. Moreover, he learned that the best customers did not like the unsanitary appearance of goods which were exposed to the elements and other mentionable hazards.

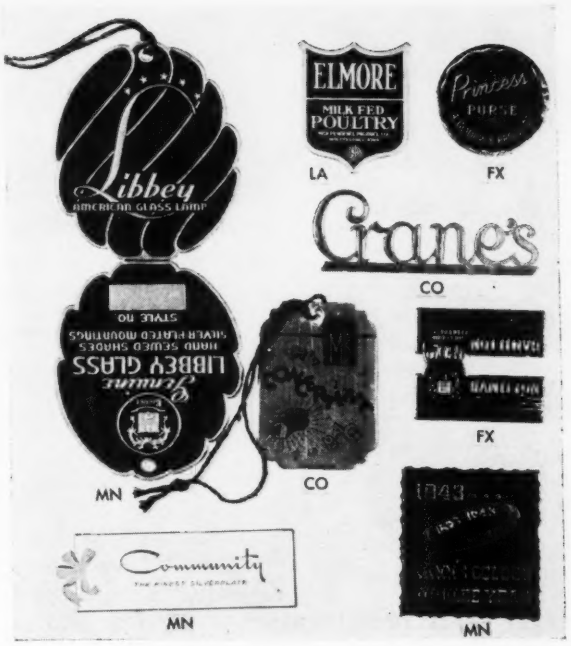
The retailer was quite willing to let the wholesaler and the manufacturer take the entire packaging job completely off his hands.

In the meantime, the country was becoming more thickly populated and the retail outlets were vastly increasing in number. People began to read newspapers. The packages bearing brand names, aided and abetted by the force of advertising, began to make their way into the corner- and cross-roads stores. Better and faster transportation enabled people to move about more freely in the exercise of their privilege of buying where they chose. This freedom of movement of goods and people increased the play of competition and the need to replace complacency with more stimulating sales appeal.

When the contents disappeared behind container walls, it became necessary for the package markings to assume some responsibility for the concealed contents, their source, quality and quantity. It was inevitable that some goods bought on faith without opportunity of inspection should turn out to be something less than was expected. Causes of dissatisfaction arose. The opportunities for chicanery were noticed by the unscrupulous. At any rate, someone (the Government) representing the public had to step in and say with authority: "Be honest and tell the whole truth regarding the contents of closed containers."

Packaging and labeling thus arrived at their present state of mutual dependence and helpfulness. Thus the system of distribution has evolved to the point where the label speaks for the qualities which the *uninformed* purchaser is expected to accept . . . qualities represented by label statements that cannot be verified by casual examination.

Correct labeling is a boon to the honest seller because it eliminates the deception and trickery of dishonest competitors, a course of dealing which tends to discredit



2—Some of the most effective labeling is done by die-cut tags applied to hard-to-identify products.

all merchandising. The success of mass distribution and the hope for comfortable living must depend upon *confidence* in the product.

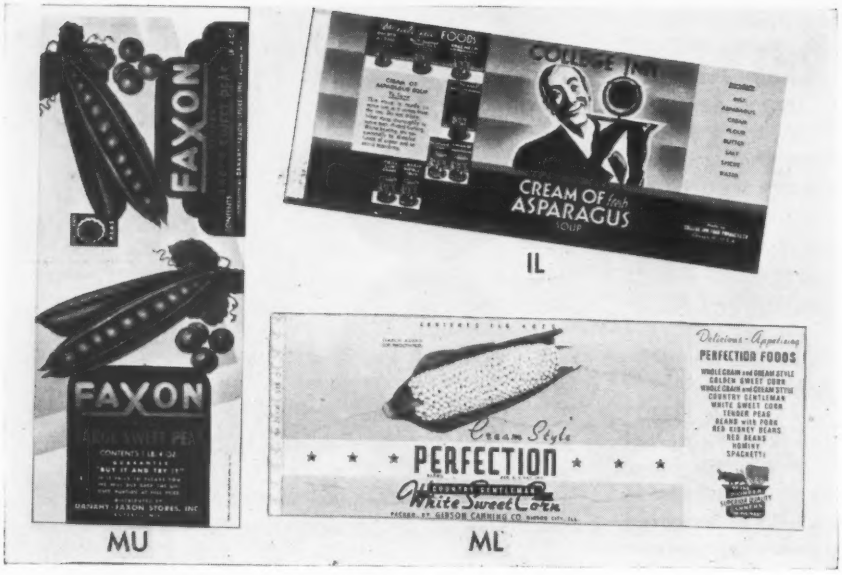
Confidence and mass distribution

Despite the dislocations and distortions of a war-torn economy, or perhaps because of them, the principles and practices of good labeling have achieved notable advances.

Labeling can be called the handmaiden of mass distribution—the merchandising process which places the greatest quantity of useful goods within the reach of eager consumers.

Rapid wartime developments taught new and better dispositions of human effort. New methods of distributing goods and of utilizing them in the home have emphasized the importance of *confidence* in the qualities and integrity of processed products without which no hope of mass consumption can be indulged. *Confidence* is the message of good labeling—confidence that honest disclosure of important characteristics will enable the purchaser to acquire what he wants and what he needs.

Many new fields of mass merchandising have been envisioned as by-products of the exigencies of war. Drudgery in the kitchen and the preparation of meals will be relieved by many plans for advance preparation of foods. Marketing operations will be shortened by new packaging and vending devices at consumer outlets. Time saved in the home will be used at the factory or farm where efficiency methods can be concentrated to effect a net saving in human effort.



3—Canned foods account for the major volume of label production. Usually of the wrap-around type, applied by high-speed machines, labels present infinite variety of appearance in spite of standardized shape of package. Note portion of label space used for mention of other products in the packer's line. Labels may be printed so they may be read when held vertically or horizontally.

Label types and processes

Types of labeled items may be classified and subdivided into groups, although the border lines between classes cannot be drawn clearly and distinctly. When does a package cease to be a package? One answer is, when the contents can be inspected without breaking the covering. The need for labeling begins at the point where the retail customer is asked to accept something on faith alone.

Labeling may consist of graphic matter imprinted *directly* on the product, as, for example on the outer skin of a fruit or melon. Paper labels are often *pasted* on fruits or melons, and decalcomania transfers are applied to hosiery and garments. Statements appearing on such articles must be truthful and in full compliance with any regulations that would pertain to a closed package containing the same articles.

In addition, labeling is sometimes accomplished by printing *directly on containers*, or by embossing without the use of any paper or ink. The pro-coated cans used for shipments overseas during World War II have been labeled by one or the other of these two methods. (See *Can Decoration*, p. 327.)

The type of container used will determine, to a large extent, the materials and the processes entering into the specifications of the labels. For example, labels for metal cans are fundamentally different from bottle labels. A classification of container types therefore results in an approximate grouping of the labels which are used upon them.

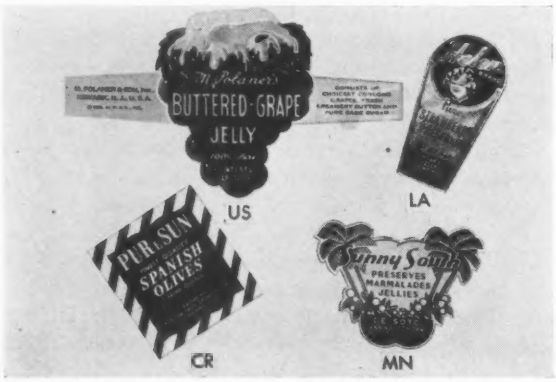
Styles and varieties of labels are as numerous as the classes of objects to which the labels are attached. Paper is the favorite basic substance because its qualities can be readily adapted to various finishes and processes.

Different combinations of paper and metallic foils are capable of producing many interesting and artistic effects. Labels which use adhesives depend for their permanence upon the rigidity of the surface to which they are affixed. Tagboards and other strong grades of paper are used where the method of attachment requires a substantial body for the label in order for it to withstand rough treatment (Fig. 2).

Labels for canned foods are usually of the wrap-around type. The ends of the label overlap and are pasted together by the operation of the labeling machine. The labels are held in position on the cans by a few spots of glue, otherwise there is no adhesive between the label and the can. The reverse side of the label may be printed with recipes, if desired (Figs. 3, 10, 23). (See *Labeling Machines and Devices*, p. 747.)

Labels for glass jars may be of the wrap-around type, but the adhesive problem may be different, especially for narrow band labels which lack strength and protection against lateral thrusts. In the new jars, the label space is recessed, and the label amounts to a mere band (Fig. 4).

4—Labels for products packed in glass are colored and die-cut to utilize visibility of the container.



Labels for closed containers

Cans—Many specialties have been packed in decorated metal canisters (now called "cans" for short) when the prospective use and volume distribution of such containers could be considered permanent and readily anticipated. Among the products packed in lithographed cans, coffee has been a conspicuous example. (See *Can Decoration*, p. 327.) However, packers of food products subject to seasonal variations in quantity, grade and geographical distribution find it more convenient to adjust quantities through the use of paper labels. Stocks of cans are therefore blank until the season's crops and destinations are known to the user. Many canned foods are stored, unlabeled, until bought by dealers who furnish the labels for their private brands.

For the labels of cans, special grades of paper, suitable for the particular purpose, are used. The stiffness and permanent flatness of the paper have a certain relationship to the direction of the grain, as well as to the size and shape of the label.

Those papers which are to be varnished, embossed or otherwise treated by the graphic arts processes are selected because of their suitability for the particular purpose. No single kind of paper can be considered best. Such technical details are usually decided by consultation with the manufacturers of the labels and the labeling equipment. There should be proper coordination between all the factors involved.

Varnishing adds brilliance and permanence to a label, protecting it from soiling and thus prolonging its effective life. Lacquer has additional qualities which give it a definite place on certain types of label. Spot varnishing may be applied during the printing process.

Embossing is a form of bas-relief, one of the earliest methods of depicting the third dimension (perspective), and thus enhancing the artistic effect. One specialized form of embossing, called "pebbling," adds character to the background and incidentally helps to assure adhesion (Figs. 1, 2, 4, 5, 18).

Labels for food products which are expected to have appetite appeal are usually designed with a pictorial representation of the food in natural colors. To this is frequently added a picture of foods prepared from a recipe. Color photography, reproduced by four-color processes, enables the artist to obtain effects which markedly increase the sales appeal of the product. Many of our illustrations demonstrate this factor, for example, Figs. 3, 4, 7, 10, 11, 19.

Metallic inks and dusting powders are used to accentuate parts of the label design that are susceptible to such treatment. Gold and silver effects are often employed (Figs. 1, 2, 4, 5).

Glass containers—Glass containers offer certain opportunities for the display of the actual contents, especially in the case of fancy fruits which are packed whole. Glass containers may use wrap-around bands, or they may use spot labels which must be applied by different machines than those used for wrap-arounds. With spot labels, the adhesive is spread over the entire surface which comes into contact with the container. Either the adhesive is applied by the labeling machine or pregummed paper is used. In using spot labels, the quality of the adhesive is quite important, and adhesive manufacturers have developed a wide range of special-purpose types. For certain products and on certain bottles, the objective is to affix the label for the



5—Alcoholic liquor labels are subjected to rigid scrutiny by national and local government agencies. Soft drink labels must comply with food and drug regulations. Makers of these products nevertheless may show distinctive individuality by use of imaginative packaging design.

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6—Time was when bakery products went to the consumer unwrapped and unprotected. Today bread, pastry, rolls, etc., are machine wrapped, often heat sealed, with the maker's mark of confidence signified by label or seal.

term of its natural life, but on other bottles—beer and soft drinks, for example—the adhesive is expected to give up its job after one trip (Figs. 4, 5).

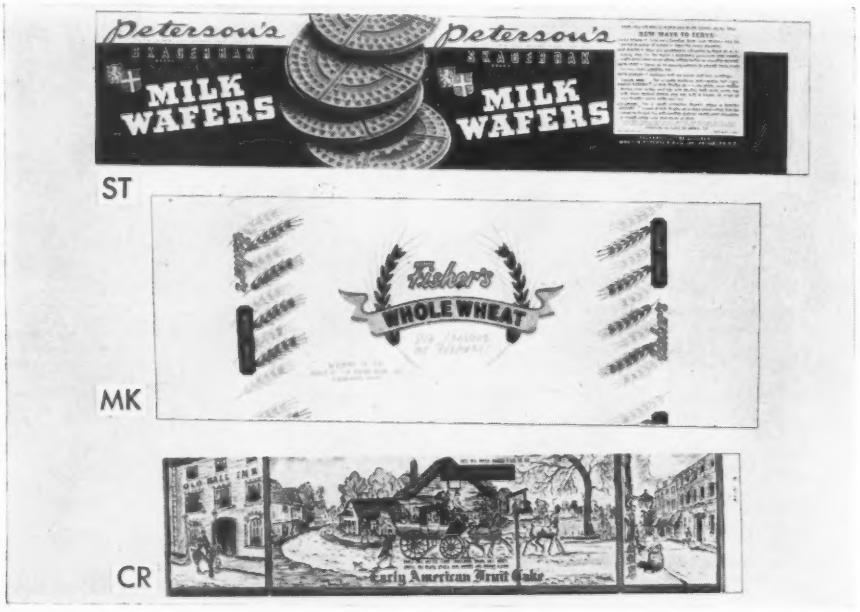
However, those bottles which are collected and reused for the same product may have the entire "label" blown in the bottle, and certain processes have been devised for obtaining color and decorative effects which thus will become a permanent part of the walls of the container.

Some products regularly use a combination of paper labeling and blown glass labeling; for example, in bottles for distilled spirits the contents statement and the statutory Federal legend are blown in the bottle, but, in addition, elaborately designed paper labels are employed (Fig. 5).

It is often possible to concentrate all the mandatory label requirements on the cap or closure of the container although it is not customary to waste any container wall space which can be used to sell the goods *and more goods.* Per square inch of display space, container walls are usually esteemed to be among the most valuable of places which can be used for advertising purposes. Even the neck of the bottle is used for display purposes on beverage and condiment bottles. (See *Using Package Surface*, p. 79.)

Fruit box labels

Fresh fruits and vegetables are packed in boxes of various sizes and capacities, and these containers have been standardized by Federal law. Many of the agricultural products themselves have been standardized, and as such they are permitted to be labeled with the letters "U. S." For fruit box labels, see Fig. 11.



7—Specialty products in the bakery field require unusual types of label. The slower moving milk wafer is packaged in tin with a wrap-around label as is the long-lasting fruit cake, while a whole-wheat bread is packaged in a transparent wrapper which is printed.

Gift wraps

Gift packages offer an unusual opportunity for advertising branches and agencies in the same locality, where similar purchases may be made. Sentiment and local color play an important part in gift packaging (Fig. 27).

Product stickers

Individual vegetables and fruits are often labeled to show the ranch or farm where they are grown. There is no doubt that such advertising helps to build up a demand from the public. When the consumer asks for goods by name, there is less difficulty in placing the product in the channels of trade. Meats, bakery products and other foods are often labeled with stickers. The label paper is greaseproof and does not soil or soak up grease and shortening. Special inks for the printing of such labels are also made to resist grease so that they will not run or "bleed off" on the food product.

Thermoplastic labeling for bakery goods

Thermoplastic labels automatically applied from a roll are now widely used on bread, cake and bun packages. The thermoplastics previously available were hardly suitable for application to heavily waxed papers because of the difficulty of penetrating the layer of paraffin on the paper.

One company which manufactures paper discovered that its wax adhesive mixture (amorphous wax involving the addition of latex), developed originally for processed-cheese wrappers, made an excellent thermoplastic adhesive, perfectly practical for labels applied to waxed paper, cellophane, lacquered glassine, kraft paper or almost any type of wrapping material in use today. Labels for various bakery goods are illustrated in Figs. 6 and 7.

Other thermoplastic hot melts and lacquers are sometimes usable with cellophane and lacquered glassine, but the mixture of paraffin, latex emulsion and suitable plasticizers seems to be the best over-all answer to the problem. It is applied either before the printing operation or immediately thereafter, depending upon the printing press equipment used. (See *Labeling Machines and Devices*, p. 747.)

Over-all wraps as labels

Metal containers with cylindrical walls are strong, which is the reason they are used to protect fluid contents. However, other types of container may have rectangular walls. Among these are packages for tight-wrapped articles having form and substance which are adequate to withstand the trip from manufacturer to consumer. The fact that the wrapper completely envelops the article and renders it *uninspectable*, makes it "packaged goods," sold on faith, and therefore subject to labeling laws for the benefit of the consumer.

The tight wrapper of a set-up box is, or may be, its label. Of course the label could be on the box, just as it could be on a carton if the outer wrapper is transparent so as not to interfere with the legibility of the label. Many tight-wrapped packages use papers which have been especially designed.



8—Even the small labels on candy rolls, chewing gum, etc., may achieve colorful distinctiveness.

Confectionery and chewing gums (Fig. 8) are in the category of packaged goods which are required by law to be labeled with a statement of the ingredients.

Cartons and "shells" for cereal products are large users of over-all wraps as labels (Fig. 20).

Seals

The seals that identified the Sumerian pottery, the Egyptian papyri and the edicts of the Middle Ages have set the style for the elaborate dignity of their modern counterparts.

Although seals are made by the graphic arts processes, they retain an individuality befitting the products to which they are attached. Label seals are usually embossed and die-cut to circular or oval shape; they make effective use of metalized papers or foil and they are often embellished by hand to produce elaborate and artistic finishes.

The gummed papers are often employed for seals, in which event the adhesive should be selected to suit the surfaces on which the labels are to be affixed. Seals are effective for cosmetics and perfumes.

Insignia

The use of symbolic designs for identification purposes is steadily increasing. Recent additions to this field are sponsored by the Poultry Canners Association.

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9—Labels may be used for convenience as mailing stickers or to carry special advertising messages.



10—Trade figures, recipes, product uses or colorful cartoons are some of the uses for label space.

It should be understood that some seals are intended to mean that the product is backed by a guaranty, whereas other seals merely provide a convenient visual form of identification which is only an implied warranty of integrity.

Decalcomania transfers

Decalcomania transfers are used for the reproduction of trade-marks, brand names and other data upon packages made of glass, metal, plastic or wood—on any type of rigid container, in fact, which permits either the product or the surface of the package to serve as a background for the lettering or the decoration. This process of applying transparent labels to containers permits the use of a great number of colors and the attainment of highly decorative label effects.

Once it is properly applied, a decalcomania becomes a permanent part of the surface, withstanding cleaning and considerable wear (Fig. 1).

Transparent labels

The effects of a transparent label may be achieved on rigid containers and displays made of cellulose acetate or cellulose nitrate. The sheet of material is printed or stamped from roll leaf while flat and is then fabricated into a three-dimensional container. If the printing is designed without a background, the transparent label becomes an integral part of the container.

Labels may be printed on sheets of cellulose film which are backed with a suitable adhesive to make them adhere to the walls of a glass or plastic container. Since the carrying material is thin and transparent, the type and decorative matter seem to be applied directly to the surface of the container. When such printing is applied in reverse to the rear surface of the cellulose material, the label becomes impervious to stains, water, grease, etc. These labels may be successfully applied to glass, plastics, metal, wood, rigid transparent cellulose and nonabsorbent papers of all types. Patents are claimed for this labeling process.

Glass labels

Decorative effects of high order can be obtained through the direct application of color to the glass containers proper.

This treatment, at first restricted largely to dairy and food products, is now used in the cosmetic, pharmaceutical and proprietary fields. Fused-in colors are applied by the manufacturer of the container and are a part of the package itself.

Labels for plastics

Plastics are made from a wide variety of substances having different physical characteristics. Recognizing the necessity to inform consumers regarding the special properties of each class of plastics, the industry has already adopted a scheme of labeling. For example, a plastic made of ethyl cellulose would be labeled as follows: "This is a plastic—(trade name). Tough, nonshatterable, light in weight, warm to touch, nonrusting, noncorrodible, color solid throughout, tasteless, and color-fast. Wash only in warm, not boiling, water, with mild soap. Use no abrasives. Avoid flame or high heat."

Labels for fibre cans

Fibre cans are made with cylindrical walls and metal ends for dry powders and are even used as the outer protection of containers for viscous liquids in the nonfood class. These fibre containers are not intended to be used for products that are subjected to heat sterilization in the containers.

Fibre cans may be labeled during their manufacture, in which event the metal ends of the cans are crimped over the edges of the label. The dimensions of such labels are therefore a matter to be considered before ordering the labels sent to the can manufacturer. If the labels are to be attached by a labeling machine after the cans have been manufactured, they will have an entirely different set of dimensions.

Labels for frozen food containers

Latest contribution to the problem of packaging frozen foods is a new type of container recently announced by a can manufacturer. The container has walls of paraffin-impregnated fibreboard with ends of light tin plate. It is said to require no inner or outer wrapper, the label being applied directly to the fibreboard. The package is easily opened by peeling off the end after starting it with a knife or hook type of opener. It is said that fruits and other products packed in sirups or liquids can be thawed in the package without leakage or discoloration due to oxidation.

Informative tags

Utensils, appliances, tools, implements and equipment are labeled with *informative* tags or attached labels, because the article will give better service if its suitability is fully explained before it is selected by the prospective purchaser. Mere sales talk is never so convincing as the manufacturer's written claim, even if the salesperson is fully competent and trained to conduct the sales negotiations (Figs. 2, 18).

Tobacco products are required to be labeled with the license number of the factory at which the excise tax was paid. Most cigars are labeled with a band, more or less ornate, to identify the brand (Fig. 1).

Convenience labels

So-called convenience labels make no attempt to describe the contents of packages or the articles to which they are attached. Address labels are a familiar type, and there are innumerable "message" labels or stickers which serve a useful purpose when pasted on a package or even on a letterhead (Fig. 9).

Some of the labels in this group, however, partake of the character and dignity of postage stamps and are extensively used for advertising purposes. They are sometimes called seals, although rectangular in shape, and are sold in sheets with perforations.

Stock labels

Stock labels in semicomplete form enable small distributors to avoid the expense of special label designs and, at the same time, obtain quick delivery of quantities to suit their immediate needs. By imprinting a few additional details, stock labels are ready for use in less time than would be required to prepare special labels. Specialists in this line offer a wide choice of designs, not only for can labels but for the die-cut variety of bottle label as well.

Utility labels

Utility labels do not ordinarily carry a vignette or the name of a particular commodity, although they usually carry the name and trade-mark of a vendor. They are "general purpose" labels. A stock label usually carries a suitable background for imprinting the name and address and commodity classification. An address label might be either a utility label or a so-called convenience label (Fig. 9).

Inserts

Folders or circulars which accompany articles at time of sale are in the category of labels even though not attached to the articles. Even in cases where the circulars and the goods are shipped separately, the Supreme Court has held that the common origin and destination of both circular and product produce a situation which brings the circular within the definition of labeling. In such cases, both the Federal Trade Commission and the Food and Drug Administration have jurisdiction in protecting the public against misrepresentation.

Outserts

The practice of using surplus label space to advertise other products has been extended still further by using the package or container as a carrier for circulars that are cleverly folded so as to remain closed when labeled to the outside of the container but are easily detached when the container ultimately reaches the hands of the consumer.

These folded circulars have become known as "outserts." They can be attached by hand or machine to the outside of cans, bottles, jars, cartons or bags. Their functions may be summarized as follows:

1. Variety of uses of recipes
2. Cross advertising (using one product to help sell another)

They can also be used to promote premiums without wasted circulars and without entailing additional cost for distribution purposes.

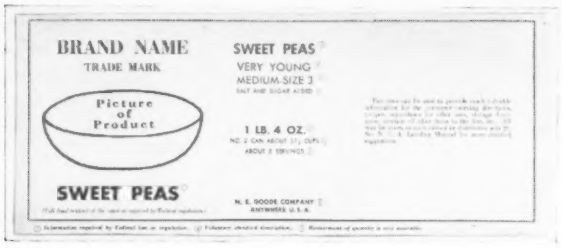
Motif labels

It is not necessary for a food product label to be formal and prosaic. Some label designers point out that

11—Shipping cases for fresh fruit and vegetables are labeled with the producer's proud trade-mark.



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12—The National Canners Association devised this "pattern" to comply with governmental requirements.

foods for humans, prepared by humans, never lack human interest, so why not give them a genuine personality?

Many recent examples of the label makers' art have used surplus label space to depict fanciful characters of the farm and kitchen, joyful in their preoccupation with harvesting and processing, not to mention the incidental diversions that bring refreshment and appetite appeal to the products of the soil (Fig. 10, 13, 23).

Processor's lot number

When the quality or integrity of a product may be questioned frequently, provision is usually made for identification of lot number and/or date of manufacture by using some code-marking device which will enable the manufacturer to trace the product through his manufacturing and packaging operations. Drugs and pharmaceuticals are definitely in this category. There are various ways of accomplishing this code marking or identification.

Sometimes code marking is done by perforating the labels or by printing code letters on the labels. Machines have been built especially for such purposes. Canners of food products frequently emboss code symbols in the tops of cans. During the late war, all canned fruits and vegetables shipped overseas were identified by a five-letter code stamped or embossed on the tops of pro-coated cans. (See *Code Marking Equipment*, p. 751.)

Labeling standardized containers

A demonstration of the value of standardized containers has come as a by-product from the war experiences in the transport of great quantities of packing cases. By strapping or otherwise fastening together a quantity of packing cases arranged suitably on a pallet or movable skid, it has been possible to handle the pallet and its load as a single item by mechanical means under the control of one person. The pallets must necessarily fit into the standard box cars, therefore the packing cases must fit the pallet, and the containers must fit the packing cases. The labor saving accomplished by such methods furnishes adequate proof of the value of standardized sizes which are given variety by use of well designed labels.

Label statements—required and optional

Labels carry the messages by which physical objects undertake to describe themselves. What messages *must* they carry? What messages *may* they carry? Public opinion demands certain minima of truth and accuracy. To prevent false or misleading representation, many substances are required *by law* to be labeled adequately to inform the public regarding the true character of these substances. Laws also contain provisions that certain substances, if labeled shall be honestly and correctly labeled. The sources of law are either Federal, state or municipal. (See *Governmental Regulation of Packaging*, p. 99.)

Definable qualities of goods

Developments in labeling follow closely the progress made by science in defining properties and qualities of articles offered for sale to the general public. Research must first determine what properties are definable and must establish practicable tests and standards by means of which the labeled products may be tested for compliance with the standards. Unless compliance can be tested within a reasonable degree of accuracy, it would not be practicable to set up a legal definition and a penalty for offering a product that does not conform to the minimum legal requirement.

This practical view of the enforceability of minimum legal standards has resulted in the enactment of laws which *require* certain statements (frequently called "mandatory statements") but which nevertheless *permit* other statements (frequently called "permissive statements"), if they do not directly or inferentially misrepresent the qualities of the product.

The mandatory statements in regard to any product are those statements which the lawmakers think should define the qualities which are likely to be misrepresented to the extent that an innocent purchaser might be harmed by the deception. The product should have the properties which are ordinarily expected by the consumer, and the product should not be adulterated or misbranded to the extent that its value for customary purposes is deceptive. (See *Sins of Misbranding*, p. 107.)

The development of labeling laws

More than 35 years ago, Dr. Harvey Wiley began his crusade against adulteration, misbranding and the use of preservatives to conceal inferiority in foods. As a result, the nation acquired the Food and Drugs Act of 1906 which immediately became the criterion of labeling in interstate commerce. Although it was intended to require the disclosure of certain ingredients, subsequent amendments to the law gave it the control of quantity declarations, and it established a minimum standard of quality for canned foods.

More recently, the (Copeland) Food, Drug and Cosmetic Act of 1938 has taken over and enlarged the scope of quality standards and the disclosure of ingredients.

Many of the states have followed the Federal pattern by passing similar or identical Food, Drug and Cosmetic Acts. Other Federal agencies have also been vested with greater authority. Recent amendments to the Federal Trade Commission Act have given it more effective jurisdiction over unfair practices in commerce, including false representations in the sale of goods. Under authority of a special statute, the Federal Alcohol Administration issued very detailed regulations for the identification and labeling of liquors, wines, malt and other alcoholic beverages. The procedures for determining standards now have all the force and, incidentally, all the intricacy of law. In fact, the principal activity of the Label Manufacturers National Association is the study and interpretation of laws, regulations and rulings as the basis of detailed advice to its members regarding correct labeling under Federal, state and local laws.

Label defined

As used in the Federal Food, Drug and Cosmetic Act, "the term 'label' means a display of written, printed or graphic matter upon the immediate container of any article; and a requirement is made by or under authority of this Act that any word, statement or other information appearing on the label shall not be considered to be complied with unless such word, statement or other information also appears on the outside container or wrapper, if any there be, of the retail package of such article, or is easily legible through the outside container or wrapper."

The Act also states that the term "labeling" means "all labels and other written, printed or graphic matter (1) upon any article or any of its containers or wrappers, or (2) accompanying such article."

The regulations state that "labeling includes all written, printed or graphic matter accompanying an article at any time while such article is in interstate commerce or held for sale after shipment delivery in interstate commerce."

The mandatory label statements

The requirements of the Federal Food, Drug and Cosmetic Act in respect to food labeling are basically few in number. Generally, these requirements are: first, the name of the product, if defined and standardized under administrative procedure, otherwise a complete description including a statement of ingredients (there are some exemptions); second, the quantity in the container; and, third, name and address of the packer or distributor, and there is a possible fourth—if artificial flavoring, coloring or preservative is present, it must be declared on the label (Fig. 12).

Legally, these three or four facts must be conspicuously shown on the portion of the label intended for display purposes. The only restriction upon the remaining label space is that it may not be used to diminish the conspicuousness of the required statements



13—Sirups and juices, packed in metal or glass containers carry appropriate identifying labels.

or to mislead the purchaser regarding the quantity or quality of the actual contents of the container.

High lights of the federal act

Compounds—The labeling of a product which contains two or more ingredients may be misleading by reason of the designation of such product in such labeling by a name which includes or suggests the name of one or more, but not all, such ingredients, even though the names of all ingredients may be completely stated elsewhere in the labeling of the product.

Ingredients—The presence of spices, flavorings, artificial colorings or preservatives must be stated on the label (Fig. 13). A product consisting of two or more ingredients, if the product is not defined by regulations, must be properly labeled to reveal the proportion of each of the ingredients.

Even though it may not be in package form, a food which contains spices, artificial coloring, flavoring or chemical preservative must be labeled to reveal that

14—Foreign languages are permissible but English must appear, too, on soaps and soap powder labels.



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fact. Certain ingredients are required to be named if present in drug products.

Drugs—Detailed provisions cover the definition and labeling of "new" drugs. Certain provisions apply specifically to the labeling of narcotics and of the habit-forming drugs (Fig. 1).

Vitamins—Any food which purports to be intended for special dietary uses is required to bear certain label statements in regard to the basis of any claims which mention the presence or absence of certain ingredients such as vitamins, calcium, phosphorus, iron, iodine, protein, fat, carbohydrate, saccharin, and the nutritional or dietary effects attributed to the food product. A mere listing of such ingredients naturally occurring in the product does not necessitate a supplementary label statement but any modification of the product in relation to such ingredients or any imputation of usefulness in a special diet may require a special label statement in order to comply with the governmental regulations (Fig. 20).

Drugs for self-medication

The Food and Drug Administration recently issued labeling regulations which divide retail packaged medicines into three categories. They are: products safe for self-medication, which must carry full directions explaining what they are good for, how much to take, when and how; products unsafe or ineffective without a doctor's supervision, which must be marked: "To be dispensed only by or on the prescription of a physician including dentist or veterinarian"; and a small group of products, usages of which are presumed to be familiar to everyone, which may omit complete directions or the prescription legend. These include aspirin, sodium bicarbonate, tincture of iodine, etc.

15—Meat products, once sold only in bulk, are being merchandised as branded, labeled, packaged goods. Often, printed transparent wrappers are employed.



Scientific opinion—Where there is a material weight of scientific opinion contrary to a representation made on a label, this fact may render the label misleading and therefore illegal.

Distributor—If a product is not manufactured by the person whose name appears on the label, the name must be qualified by a phrase which reveals the connection such person has with the product, such as "Manufactured for and Packed by . . .," "Distributed by . . .," or another similar phrase which clearly expresses the facts in the case.

Street address—If the name of the manufacturer or distributor of a product is not shown in the current city directory or telephone directory, it is necessary that the label shall show the street address in connection with the place of business.

Conspicuous information—Any word, statement or other information required to appear on the label must be prominently and conspicuously shown on the part of the label which is presented or displayed under customary conditions of purchase. In other words, the consumer must have every opportunity to observe the facts in which he is, or may be, interested. Failure of the label to include all the essential information will not be excused because of the fact that the label space is used for purposes not required under the statute, or because of the fact that the label does not use all of the space available for such a statement on the package.

English language—The English language is required for all mandatory label information; if the label contains any representation in a foreign language, all words, statements and other information required by the act must appear thereon in the foreign language. However, the foreign language must not be permitted to interfere with, or use the space needed for, the labeling which is required in the English language (Fig. 14).

Contents—Detailed provisions cover the manner of stating the quantity of the contents in the package, and there is a provision that the statement of weight or measure may be supplemented by the metric weight or measure indications.

With only a few exceptions, the statement of contents must express the quantity in terms of the largest unit of measure contained in the package. For example, the label on a package containing one quart is not permitted to read "2 pt." or "32 fluid oz." Provision is made for variations due to unavoidable conditions, and certain exemptions from the provisions are provided for very small packages.

Substances that are usually sold by weight must be marked to show the contents in terms of avoirdupois. Substances commonly sold by volume must be marked in terms of fluid measure. A few substances may be labeled to show the contents by either or both terms. Condensed milk is frequently shown both ways to facilitate the preparation of infants' feeding mixtures.

Open containers—Under certain conditions, small

open containers of fresh fruits or vegetables need not be labeled, but if two or more such containers are enclosed in a crate or other shipping package, such crate or package must bear labeling showing the number of such containers enclosed therein and the quantity of the contents of each.

Transit exemptions—Certain exemptions, under regulations, are provided for shipments of products in the trade, to be processed, labeled or repacked. The Food and Drug Administration has recently emphasized, however, that this provision of the law must not be used to evade the intent by confusing the responsibility. The arrangements between shipper and receiver must be made in good faith, otherwise the Food and Drug Administration will take action against both of them.

Shipments for export are exempted if properly labeled according to the laws of the country to which such shipments are to be exported.

Before the war, Britain was a large importer of canned goods from the U. S. A., and no doubt Britain will resume such importations in volume as soon as her foreign exchange attains an easier position. American exporters will take notice that a new regulation has become effective in Britain covering such imports. It is the Labeling of Food (No. 2) Order, 1944. In general, its requirements are similar to our own Food, Drug and Cosmetic Act, although the requirements pertaining to vitamin claims are somewhat different.

In Soviet Russia, industrial enterprises must set up bureaus which will be responsible for the quality of the products manufactured. Within the past year, a decree was issued forbidding enterprises to turn out goods "without properly labeling or marking them." This decree provides that the goods must be produced under technical conditions and according to specifications. Foods, cosmetics, cooking utensils and other commodities which may affect the health of the consumers must meet certain specifications and also must pass sanitary inspection, according to the provisions of the decree.

The United Nations Relief and Rehabilitation Administration (UNRRA) uses a special label for products purchased for relief shipments to war-devastated areas.

Special regulations and standards

Generally, a substance that is properly labeled under the Federal law is also properly labeled under the state law, although in some cases the state laws contain additional or different provisions. Most of the states also have their own pharmacy laws which, so far as they relate to the labeling of drugs and poisons, are not in conflict with the Federal Food, Drug and Cosmetic Act. (For further information on this subject, see *Governmental Regulations of Packaging*, p. 99.)

Narcotics, etc.—The states also have their own laws controlling the sale of narcotics and habit-forming drugs, and their own laws in relation to specific poisons or dangerous substances, such as carbolic acid, bichloride of mercury and wood alcohol.

Poisons—To protect the public, certain label symbols are required by law: for example, most state laws require that the skull and cross bones shall be displayed on poison labels (Fig. 1).



16—Label can carry attractive pictorial of product in use, which affords good substitute for visibility.



17—Accurate identity and precautionary legends are essential in labeling paints, oils and chemicals.

Alcoholic beverages—These are controlled by Federal legislation and its regulations in respect to the labeling of all intoxicating liquors. Some states also have their own laws on the same subject (see p. 104).

Beer and malt beverages—Labeling of these products has had a hectic career in recent years. When cans were plentiful, canned beer enjoyed a very large distribution. Like all alcoholic beverages, beer and ale are subject to state as well as Federal regulations. Everything shown on the label must be approved in advance by the duly constituted authorities (Fig. 5).

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18—Hardware and novelty store articles are difficult to label but adhesive stickers often solve the problem. Toy and game wraps for use on set-up boxes are a real challenge to the art of the label designer.

Dehydrated vegetables—Such products were the subject of many experiments stimulated by the need to reduce bulk when shipping space overseas was at a premium during the war. The dehydration of vegetables is not uniformly satisfactory. Beets, carrots, onions and potatoes are said to be the most satisfactory. In a recent test of consumer acceptance, these products were packed in tin containers, each containing about four servings. The industry has a trade association, and the products are identified by a special seal of "approved quality."

Meat products—Many meat products are prepared and packed in the general manner of sterilized canned and bottled foods. There are also other methods of placing meat products in wrappers or coverings which must be marked or labeled in establishments where the entire output of food products is subjected to inspection by Federal agents (Fig. 15).

Poultry products—Poultry is packed under the jurisdiction of the Production and Marketing Administration under standards for both fresh and canned products (Fig. 15).

The poultry canning industry is among those adopting a special seal for their products which will be under Federal inspection.

Shellfish—Packing establishments have the privilege of Government inspection under which they may label their goods in a manner to indicate that fact. Strict sanitary regulations cover all plant operations.

Paints, etc.—Federal and state laws regulate the sale and the labeling of paint, varnish, naval stores, linseed oil, turpentine, putty and benzine.

Hazardous chemicals—Hazardous chemicals have long been a problem for those who are required to handle the containers in which they are packed for shipment and storage. The Manufacturing Chemists Association has recently prepared the first comprehensive systemization and standardization of labeling for protection against such hazards, and has issued a special manual which outlines the principles that should govern the preparation of precautionary labels. Such products are divided into categories for each of which a special type of label includes recommended advice and warnings (Fig. 17).

Pet foods, etc.—Substances not intended for human use or consumption include pet animal foods, stock or commercial feeds and tonics, livestock remedies, and other products employed in connection with the raising of animals. Special Federal and state laws apply to many of the products in this category.

Insecticides—Insecticides of various kinds developed during the war are now becoming available for civilian distribution. Insecticides in interstate commerce are subject to the provisions of the Federal Insecticide Act which contains special provisions regarding labeling. In some cases a statement of ingredients is required. Labelers of insecticides should confer with the Insecticide Division, Livestock Branch, Production and Marketing Administration, Department of Agriculture, Washington 25, D. C. This department has made a careful study of the toxic effects of DDT in various strengths. Many states also have laws covering insecticides. In California they are known as "economic poisons."

Wool products—The Wool Products Labeling Act is administered by the Federal Trade Commission and it provides for the disclosure of the fibre content of woolen or purported woolen merchandise which is manufactured for, or marketed in, commerce. The label must declare the fibre content, as defined in the law. This situa-

tion is typical of the class of information recommended for voluntary use with "informative" labeling.

Nonpackaged items—Excepting for wool products, the labeling of fabrics and other substances not sold in package form is not usually required by law, but if found falsely labeled, the offenders can be reached by laws which require complete honesty in advertising.

There is now a growing tendency to increase the legal requirements so as to compel complete disclosure regarding component materials and their qualities. The Federal Trade Commission has jurisdiction over honesty in advertising.

Prohibited label elements—Among the things which may not be placed on labels for domestic use are representations of the flag of the United States or of any state. The Federal Alcohol Administration has prescribed a number of subjects which may not be depicted on any label for alcoholic liquors.

Trade practice conference rules—In some instances the Federal Trade Commission has approved trade practice conference rules establishing standards and voluntary labeling requirements for many products.

Quality standards—Certain products are guaranteed by "Seals of Approval" furnished by *Good Housekeeping* magazine, the American Medical Association and by some trade organizations. Such approvals are limited in scope. A recent survey reported by *Good Housekeeping* magazine showed that 72 per cent of the women in the top income group interviewed said that they were influenced by approval stamps. In the lowest income group, 45.3 per cent said they were influenced.

Department of Agriculture shield—The shield design of the Department of Agriculture may be used on products which are entitled to carry the legend: "Packed under Continuous Inspection of U. S. Department of Agriculture" (Fig. 15).

Standards—Labels which undertake to state or imply that products comply with Federal specifications should conform to the regulations of the National Bureau of Standards in regard to the language of labels which guarantee quality. If the National Bureau of Standards tests a device and issues a certificate applying to that device, the manufacturer may advertise (label) that fact, provided he does not create the impression that the National Bureau of Standards has tested and approved his entire line of products.

Protecting the consumer

It is fair to state that no movement toward better labeling can proceed far without the active interest and cooperation, if not the initiative, of actual consumers. The standardizing and defining of grades and qualities by official, quasi-official and purely voluntary organizations stem from the demonstrated need for better information and better understanding on the part of the consuming public as a whole.

All of the various organizations of consumers have performed yeoman service in pointing out the needs which subsequently motivate the official determinations of standards made available by label declaration and honest advertising. (See also p. 303.) The part taken by the Federal Trade Commission in preventing false and deceptive advertising claims has been of enormous benefit to the public and incidentally to the great body of honest distributors who find it difficult to compete with the inducements offered by unscrupulous competitors. Labeling is a form of advertising and, to the extent that the Federal Trade Commission has jurisdiction, both primary and concurrent, with other agencies, labeling standards may be the object of most solicitous care on the part of that governmental agency.

The genesis of label terminology

Labeling is a field of progressive study. The exploration of the definable qualities of goods, and the consumer's expectation with reference to such goods, leads to the adoption of semiofficial standards which, if used as label terms, eventually acquire a legal meaning with reference to the qualities of such goods. At the same time, such exploratory investigations of definable qualities lead to simplification and standardization of terms, which, through their educational value to consumers, justify a reliance upon the goods so labeled. Consumer education in respect to definable qualities eventually leads to a genuine demand for the legal adoption of this kind of labeling terminology.

The qualities of food products are not static—they are improved and developed by scientific farming, selection, cross-breeding and other techniques already developed or to be developed. Consumers' tastes change as they have the opportunity of becoming acquainted with better qualities and better processing methods.

It would be most unwise to "freeze" a quality at any particular level by removing the incentive to produce higher qualities. Continuous research is an important factor in the development of more acceptable food products. The National Canners Association maintains for its members a fully equipped and staffed research

19—Packaging of frozen and dehydrated foods presents an opportunity to use pictorials on labels.



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20—The outer wrap for packages containing cereals and grain products often serves as an all-around label covering a fibre can or a carton shell.

laboratory where the definable characteristics of agricultural products are being constantly tested by every means known to science. In the final analysis, consumer acceptance is the test on which to base mass production which, in turn, influences enterprisers to improve quality and reduce price for the purpose of increasing the volume of production. This happens also to be the reason why food processors insist upon adequate identification and uniformity of their products which must compete with all other demands for the consumers' dollars.

Kinds of labeling

Every product has its own range of definable characteristics. Attempts to select groups of such qualities for labeling purposes emphasize the need for generic terms to define *kinds of labeling*. Appropriate adjectives are not easy to find, especially if they lack legal definition and must depend upon the slow process of public education. The Federal Food, Drug and Cosmetic Act requires that each definition and standard of *identity*, and each standard of quality, fixed and established for a food under Section 401 of the act, contemplates that such food and all articles used as components or ingredients thereof "shall be *clean, sound, and fit for food.*" Naturally a requirement that a food "shall be clean, sound and fit for food" is in effect a minimum standard of suitability for food purposes.

Since regulations under this act have clearly defined the identity of most food products, the public knows that such food products are of *standard* grade without further qualification.

For many years the packers of canned fruits and vegetables have offered premium or higher-than-standard grades, sometimes denominated by grade term, sometimes not. The premium products became known as "extra-standard," or "choice," or "fancy" grades, The Production and Marketing Administration, an agency of the Department of Agriculture, being authorized by law to establish grades of food products for certain purposes such as the pledging of goods for bank loans, undertook to define such terms. PMA also adapted alternative synonyms A-B-C to mean the same as "fancy," "choice," "standard" and may be so construed wherever they are used on labels or in reference to such canned products.

Any canner may label his goods "fancy," "choice" or "standard" or A-B-C, or both, provided the goods are in fact equal to such grades, as officially defined. He may go even further, if he wishes to have his goods labeled with the designation "U. S." preceding the grade term, by arranging with the Production and Marketing Administration to have Government inspection during their processing (Fig. 23).

"U. S." grades

Inspectors of the Production and Marketing Administration of the United States Department of Agriculture have been placed in certain canning factories under "continuous inspection," when requested by the canners who pay the cost of the service. Government inspectors are on duty all the time the plants are in operation. Inspectors are furnished only to plants that are using PMA grade terms in the labeling of their products. All these plants meet certain requirements relating to housekeeping and sanitation. Only canned

fruit and vegetable products packed in plants under the "continuous inspection" of the Department of Agriculture may carry the prefix "U. S." in connection with the grade designation appearing on the can (Figs. 15, 16, 23).

Consumers can buy grade-labeled canned goods—with or without the "U. S." prefix. If the prefix is used, however, it means that the product has been prepared in a plant operating under continuous inspection, and that the inspector has certified the grade. If the prefix is not shown, the grade statement means that the packer or distributor assumes the responsibility for the grade designation.

Consumer education

Consumer education and the study of consumer reactions to various methods of labeling are indispensable adjuncts to any comprehensive research program which has for its objective the improvement of label terminology. The National Education Association has recently issued a pamphlet of 128 pages entitled *Using Standards and Labels*. This pamphlet discusses every conceivable phase of product standardization and the terms by which adequate information is conveyed to consumers. It is an excellent vehicle for teaching students, and should have an important influence in crystallizing the views of consumers. We quote from the pamphlet: "Several groups, such as the National Canners Association, the National Consumer-Retailer Council, and U. S. Inspected Foods Educational Service, are working out sample label forms, aiming at widespread adoption of a few basic patterns, using uniform terms based on enforceable definitions. Likewise, the Food and Drug Administration promotes the presentation of required facts in a systematic fashion."

Helpful facts for the consumer

In addition to the label data required by law and regulations, there are many supplementary facts which are useful and helpful.

A food packer with a national reputation has made a careful study of the consumer's state of mind when approaching the problem of selecting canned foods. This study reveals that certain questions are most frequently asked:

1. What size can should I buy?
2. How many sizes are there?
3. What size can is this?
4. How many persons will it serve?
5. How may the contents best be prepared?

This authority also suggests certain additional points which should be considered in connection with the preparation of a label:

1. If the particular product is packed in cans of other sizes, list them all with the weight statement, etc., so that the consumer may select the size best suited for his needs.
2. When a particular variety, such as asparagus, peas, stringless beans, lima beans, etc., is marketed in different sizes under one brand name, a statement of this fact should be made, listing the different sizes available and listing their designations.
3. When a product, such as corn, is prepared in different styles, an explanatory statement should appear along with a list of the other styles of the product which are available.
4. Include at least one good recipe—a different one on each size can—and vary them as each run of labels is made.

For a distributor marketing a complete line of canned foods, this authority also emphasizes the importance of uniform composition and arrangement of subject matter. A consumer who becomes familiar with this pattern will be more apt to select other items in the line. Trade terms constantly repeated will eventually become familiar—for example, the numerical designation of can sizes, especially when accompanied by the weight statement, furnishes useful information to the housewife.

Terminology for labels of canned foods

A program having for its objective the adoption of uniform standard descriptive terms for voluntary use on canned and glassed foods was announced by the National Canners Association with the endorsement of National-American Wholesale Grocers' Association, National Food Brokers Association, United States Wholesale Grocers' Association and the National Association of Retail Grocers. Quoting from the announcement issued by the National Canners Association:

> Major responsibility for developing the Labeling Program will continue to rest with the Canners Association whose laboratory has made and continues to make the essential scientific determinations on which objective measurements to support the label terms are based. Final selection of recommended label terms will continue to be the judicial responsi-

21—Textile products, such as shirts and stockings, are now often packaged with producer's brand label.



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22—Salad dressings and vegetable shortenings have of late suffered shortages as to packaging materials and containers. The label producer, however, has proven equal to the task of varying his labels and wrappers to meet changes caused by the use of substitute materials.

bility of the NCA Labeling Committee and its commodity committees, but these decisions will be made only after fully and completely weighing the counsel and recommendations of the Distributors' Committee. The canners' and distributors' committees will have the benefit of consumer research conducted by the Home Makers Guild of America in the selection of label terms which are most meaningful and most readily understood by the consumer purchaser.

In connection with this program, the National Canners Association released a suggestion for label arrangement for effectively combining mandatory information with additional voluntary standard descriptive terms or specifications, together with a layout showing how label space may be advantageously used for a combination of vignette, mandatory and voluntary terms and suggestions for recipes, storage and other useful consumer information (Fig. 12).

Informative labeling of fabrics

Among retailers, especially those dealing in fabrics and other nonfood items, the term "informative labeling" has acquired a certain significance. The first requisite, of course, is that such labels shall conform to local, state and Federal regulations applicable to the particular product.

"Informative" labels serve to emphasize the following points:

1. *What it will do (performance)*—Degree of color permanence; shrinkage or stretching; breaking strength; seam slippage; resistance to water, perspiration, wind, wear; light, heat and power tests; power consumption; cost of upkeep
2. *What it is made of (composition)*—Kind and quality of fibre, metal, wood, leather, ceramics, cement, rock, fur, plastics, petroleum products, rubber, paper, bone, chemicals, drugs; ingredients of food products, etc.
3. *How it is made (construction)*—Size, weight, number of yarns per inch, weave, number of stitches per inch, finish, ply, cut, whether it be hand or machine made, whether it be pressed, molded, stamped or inlaid
4. *How to care for it*—Detailed instructions for washing and/or cleaning; precautions to be observed in cleaning or storage, refrigeration, oiling and greasing, polishing, etc.
5. *Recommended uses*—Purposes for which it is most suitable, recipes, etc.

Color fastness in dyed textiles

The labeling of dyed textiles raises certain problems which are peculiar to this kind of merchandise. It is readily appreciated that a color which is fast to washing is not necessarily as fast to light, or to crocking, or to other color-destroying agencies. Fabrics are designed for the use to which they are supposed to be put and standards are set so that the fabric will last longer when put to its intended use. If it is used for some purpose other than the one for which it was intended, then full warning should be given that it may not be quite so serviceable as when used for the original purpose.

What the "informative" label does

An authority on the use of "informative" labels or tags insists that a trade name is desirable for every product, or line of products. This authority, in discussing the benefits to be derived from the carefully planned use of informative tags, summarizes their various advantages as stated below.

"Informative" tags are used to accomplish the following things:

1. *Establish a trade name*—Since the name is on the merchandise at the point of sale, it sticks in the mind of both clerk and customer. The importance of establishing a trade name is further indicated by surveys which have shown that more than 50 per cent of retail sales may be due to the selling-power of a well-established name.

2. *Act as a silent salesman*—It keeps the customer occupied until the clerk can serve him; saves the clerk's time by answering questions the customer must otherwise address to him.
3. *Train salespeople*—Such labels give strongest selling arguments—and phrases—concerning each product; they are of especial help to the new salesman—and, similarly, facilitate transfers of clerks from slack to busy departments during holiday seasons.
4. *Gain the good will of consumer organizations*—This is gained by presenting facts.
5. *Promote correlated selling*—Other items in the line may also be mentioned when informative labels are used.
6. *Cut losses on returned goods*—They help the customer to make the proper initial selection and thus help to eliminate returns due to improper use or care of an article. Oral instructions cannot really take the place of a written reminder.
7. *Re-sell the purchaser after the sale*—An informative tag on a product helps to maintain the state of mind that prompted the original purchase—a corollary to the above.
8. *Meet legal requirements on marking*—When the law requires certain information on a tag, that tag might just as well also carry some special selling information with it.
9. *Combat vicious competitive prices*—A tag or label on better merchandise can justify the difference in price between the more costly quality products and the more competitive cut-price articles.
10. *Foster step-up selling*—A customer will often willingly pay $3.98 instead of $2.98 if it is made clear that extra wear, extra satisfaction, extra comfort, etc., are bought for the extra dollar.
11. *Make advertising more effective*—"Informative" labels remind the customer, at the vitally important point of sale, of all the advantages stressed in other advertising. A tag fills the time-gap between the moment of reading a company's advertising and the moment of arriving at the decision to purchase—a gap which frustrates many sales.
12. *Help the merchandise buyer*—He can classify the product in his line, and buy more intelligently. It may also show up unnecessarily numerous price lines, thus suggesting the elimination of some of these lines.
13. *Improve customer relations*—This is accomplished by infusing store customers with confidence in the performance to be expected from the article. The labels provide a new means of interesting customers in what they are buying and provide striking evidence of the store's willingness to give the consumer facts about what the store is offering to him.
14. *Aid the consumer who benefits from such tags and labels*—Anything which helps to reduce the cost of merchandising and selling is eventually reflected in lower prices to him. In addition, an "informative" tag or label which enables him to buy, use and care for merchandise more intelligently, conserves his income and raises his standard of living.

Self-service labeling

The super market operators have recently made an extensive survey of distribution methods to be used as soon as suitable equipment can be obtained. One of the conclusions drawn by this survey is that meats, produce, dairy, baked goods and foods will eventually become *self-service* departments throughout the entire super market industry. It is said that 64 per cent will convert their meat departments; 70 per cent their delicatessen departments; 84 per cent their produce departments, and 94 per cent their dairy departments.

Delbert R. French, a Government economist, is credited with this sage observation: "The package is the salesman in the self-service store, and there will be no sentiment against changing one salesman for a better one" (Fig. 4).

23—Consumers like recipes and pictorials on canned foods. Some makers print recipes on the reverse.





24—The bottle, the fibre can, the metal can and the sifter top can are packages popular in the field of coffee and spices. Each type of package must carry its own appropriate label.

Label space as advertising

Label space used for mandatory statements is usually a small part of the available space which can be used profitably to praise the labeled product or to advertise other products sold by the same distributor. The space is extremely valuable because it works at the point of sale, assisting the merchant in arousing the customer's interest and favorable consideration. After the goods are sold, the effective label space continues to exert a strong influence with Mrs. Consumer by stimulating the desire to use the goods and to benefit by such use. No product is fully "sold" until it is consumed. The bigger the label, the better it works, especially in the home where it confronts the whole family. This is notably true of the wrap-around style of labels on food cans and jars. Recipes and suggested food combinations take the foods out of the pantry and onto the family table. To quote one very level-headed authority: "The most satisfactory method for communicating information from manufacturer through retailer to consumer is a label attached to the product." This quotation is attributed to Mrs. Saidie Orr Dunbar of the General Federation of Women's Clubs. (Also see *Using Package Surface*, p. 79.)

Required statements use 10 per cent of space

Legally, all parts of the label and of the circulars accompanying the goods are a part of the labeling and are subject to the same regulations in respect to claims.

The required label statements need only a small amount of space—less than 10 per cent of the area of an average can label. The larger part of the space on can labels is exceedingly valuable as a medium to reach and influence the consumer. The packers of food products are especially fortunate in the amount of label space at their command. The trend of distributive methods and the development of product descriptions have together operated to place the consumer in position where she expects the product to tell its own story, completely, truthfully and interestingly. That situation is not unwelcome to the dealers and the middlemen: they would rather handle a product that relieves them of responsibility; they would rather display and otherwise encourage the sale of goods whose labels obviously strive to interest the consumer and stimulate new sales.

Fourteen optional uses of free label space

In contrast to the few mandatory statements, it is interesting to note the wide range of permitted uses of label space. An examination of many labels now in use reveals at least fourteen ways to use label space to increase the prestige of the product. For example:

1. *Brand name*—Experience and tests combine to prove that the memory factor is most closely associated with the idea of a well-chosen brand name. For protection, brand names are usually registered in the United States Patent Office (Figs. 10, 22, 23, 24).

In a recent statement on behalf of the Department of Agriculture, Mr. Fitzhugh L. Southerland, Acting Chief of the Production and Marketing Administration, Service Division, is quoted as saying: "The position of the Department is and has been, for many years, to encourage a program of voluntary comprehensive labeling. The Department believes that every canner, freezer and distributor should keep his brand names and protect them."

2. *Trade-marks*—These are special designs which are used to identify all the products which have been put on the market by a particular manufacturer and to relate the various items in a line (Figs. 5, 8, 24).
3. *Vignette*—Next in importance as an aid to the memory or identification is a picture or vignette. Among certain classes of consumers, the picture is more of a memory factor than the brand name (Figs. 3, 7, 10, 16, 19, 22, 23).
4. *Side panel*—The side panel of the can has recently become a sort of overflow-space to supplement the front panel of cylindrical containers (Figs. 22, 23, 24, 25).

   If any required statements are placed on the side panel of a cylindrical container, the side panel should be at the right of the front display panel so that the reading matter runs from left to right. In other words, all required statements should be in a natural reading position with reference to the display panel.
5. *Background*—The background serves to contrast and enhance the artistic value of the label and may be used in an all-over design to present a picture of the product (Figs. 7, 10, 13).
6. *Recipes*—Recipes have been found to serve the consumer's desire for suggestions of variety in the preparation of foods. Visualized recipes are the natural-color reproductions of appetizing dishes prepared from the contents of the can. In recent years, food processors have awakened to the great merchandising possibilities of their can and jar labels. Developments in the field of direct-color photographic reproductions have stimulated the interest and have made it possible to utilize the eye appeal which has so important a part in determining choice and selection. Recipe labels have been developed through the aid of authorities in the home economic and food fields (Figs. 10, 22, 23, 24).

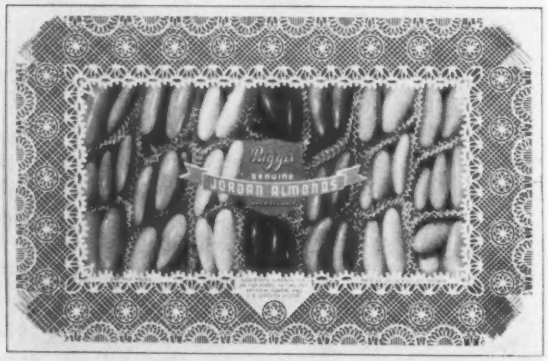
   Many vegetables and fruits are offered in appetizing and attractive servings, photographed in full color, and reproduced on canned food labels in various combinations along with the recipes for the preparation of such foods. In addition to capturing consumer interest at the point of sale with a colorful display of attractive servings of food, recipe labels specializing in eye appeal maintain consumer interest at the point of use in the housewife's kitchen. They show her how to prepare at point of sale; have appetite appeal at point of use. Colorful recipe labels accomplish a twofold stimulant to the sale of the product. They attract prospective buyers in the food store and influence repeat business by maintaining interest in the product.
7. *Back panel*—Other items in the line are mentioned on the back panel, sometimes accom-



25—Labels for dairy products are subject to rigid governmental regulations. Foil labels can be printed, afford attractive and protective outer wrappers for quick-selling items. Metal can with conventional label is the package for storage and distant shipment of evaporated milk. Die-cut labels are suitable for placing inside of the outer wrap of the package.

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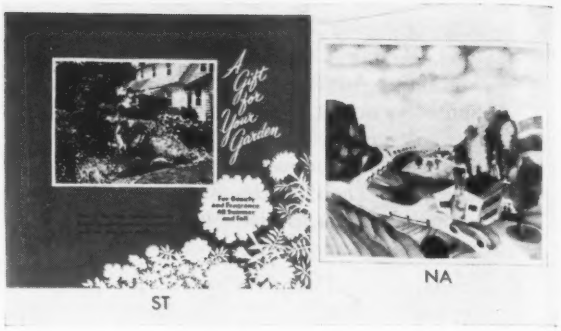




26—High grade confectionery calls for packages that represent the finest art of the label maker.

panied by color reproductions of such items or of dishes prepared from such items. The back panel is often used for recipes (Figs. 3, 10).

8. *Novel designs*—It has been found that foods for the very young are more acceptable if decorated with juvenile themes.
9. *Dietary claims*—A product may be said to be of value in correcting dietary or vitamin deficiency, but it is then subject to regulation under the Federal Food, Drug and Cosmetic Act.
10. *Premium offers*—Coupons and prizes can be advertised on the labels (Fig. 25).



27—Color-printed gift wraps, even for unusual products like garden seeds, make an excellent impression.

11. *Foreign languages*—Foreign languages are often used in addition to English on products that appeal to the foreign population. If any required statements are in the foreign language, they must appear in both languages (Fig. 14).
12. *Awards*—Reproductions of exposition medals and awards for merit are often used to increase the prestige of the product.
13. *Endorsements*—Seals of approval authorized by such organizations as the American Medical Association or *Good Housekeeping* magazine (Figs. 13, 23, 25).
14. *Two-way display labels*—Labeling for display purposes includes a two-way arrangement of text and picture, so that either upright or horizontal position of the can may be viewed equally well. The development of self-service markets has brought to light some interesting observations about the mental reactions of women shoppers in relation to a display of goods; they will not pick up goods if the act is likely to disturb or disarrange the display; they will not touch a stack of goods that has the slightest appearance of instability, but they will pick up from a jumble of cans (Fig. 3).

CREDIT—The illustrations in this chapter indicate by code letters the label manufacturers to whom credit is due for help in supplying representative samples. They are:

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CA Calvert Lithographing Co.
CO Cameo Die & Label Co.
CQ Commercial Printers, Inc.
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EP Epsen Lithographing Co.
FP Fleming-Potter Co.
FX The Foxon Co.
GA Gamse Lithographing Co., Inc.
IL Independent Lithograph Co.
LA Lambooy Label & Wrapper Co.
ME Magill-Weinsheimer Co.
MG McGill Lithograph Co.
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ML Michigan Lithographing Co.
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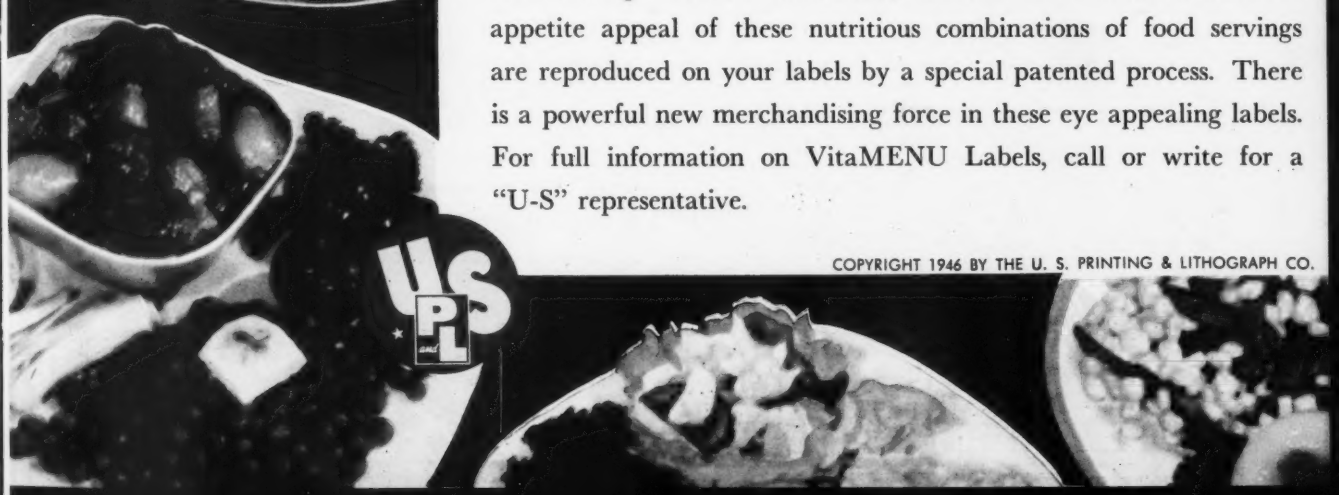


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Distinctive Trade mark

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See for yourself! Drop us a note and we'll be pleased to prepare individually designed sketches, quote prices, and furnish complete information.

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It was no accident that led us to choose the name of Cameo.

For, in making true cameos there is no substitute for skill, for craftsmanship, for artistry.

A genuine cameo cannot be other than a thing of beauty—clear, colorful, accurate.

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LABELS... Roll, Die-cut, Flat. Ungummed, Gummed, heat-sealing thermoplastic, greaseproof or crimpsealing. 1 to 5 colors. All types of stock including foil.

BAGS... Glassine, Waxed, Unwaxed.

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THE MILLER ART DEPARTMENT IS AT YOUR COMMAND!

We will redesign your old labels or create a coordinated, "punchy" group of labels to give a *separate identity* to your entire line.

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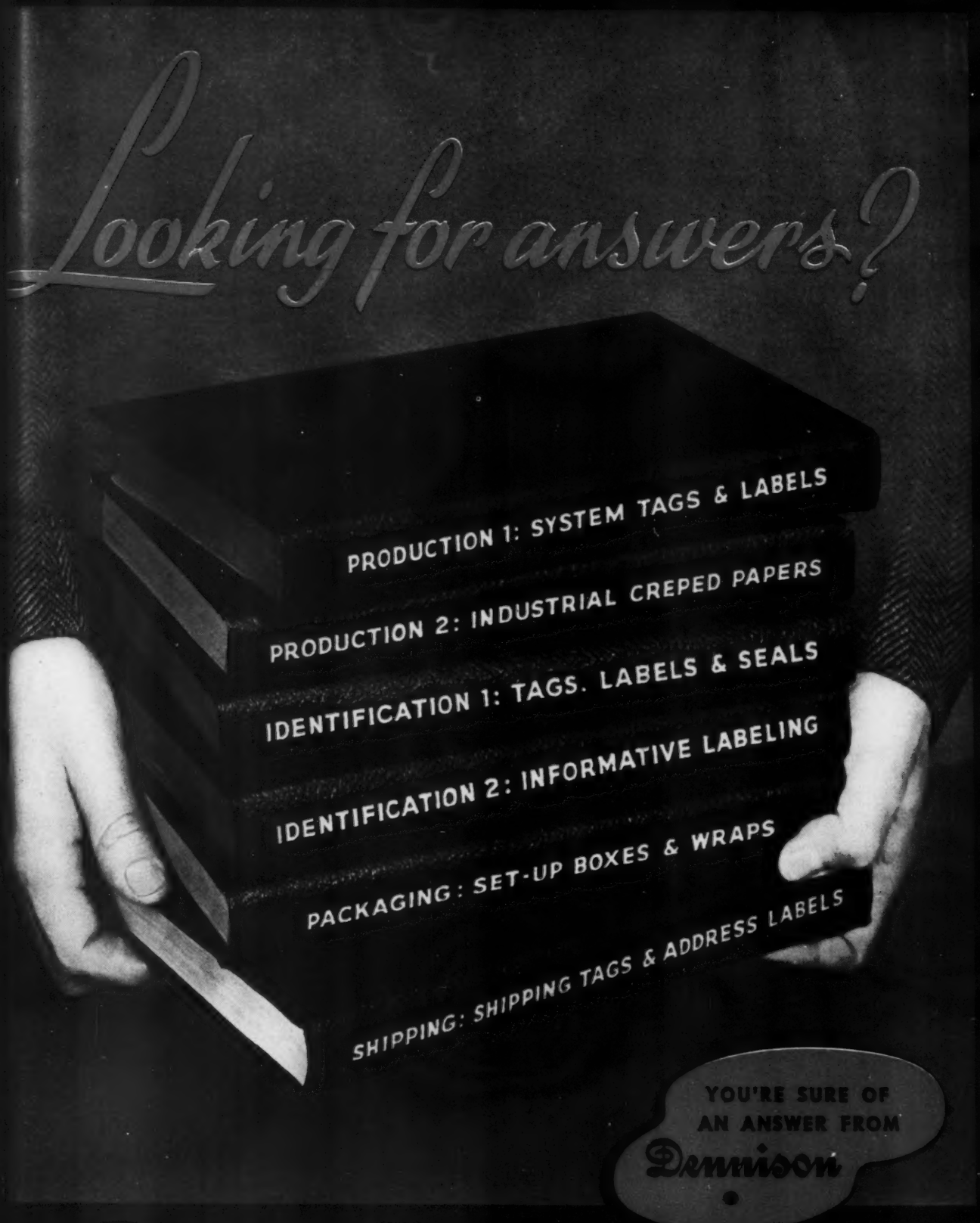
SALES-PRODUCING LABELS AND WRAPS

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*U.S. Patent No. 1803836

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LABELS are time and labor-saving TOOLS OF BUSINESS, available at an average cost of 10 for a penny. They direct, warn and instruct—save time and error. They're little spots of gummed paper that describe contents and speed the safe arrival of all your shipments—by rail or mail. TOOLS OF BUSINESS are timely offerings by EVER READY, the country's largest producer of gummed labels. whose facilities (mental and mechanical) help solve your label problems.

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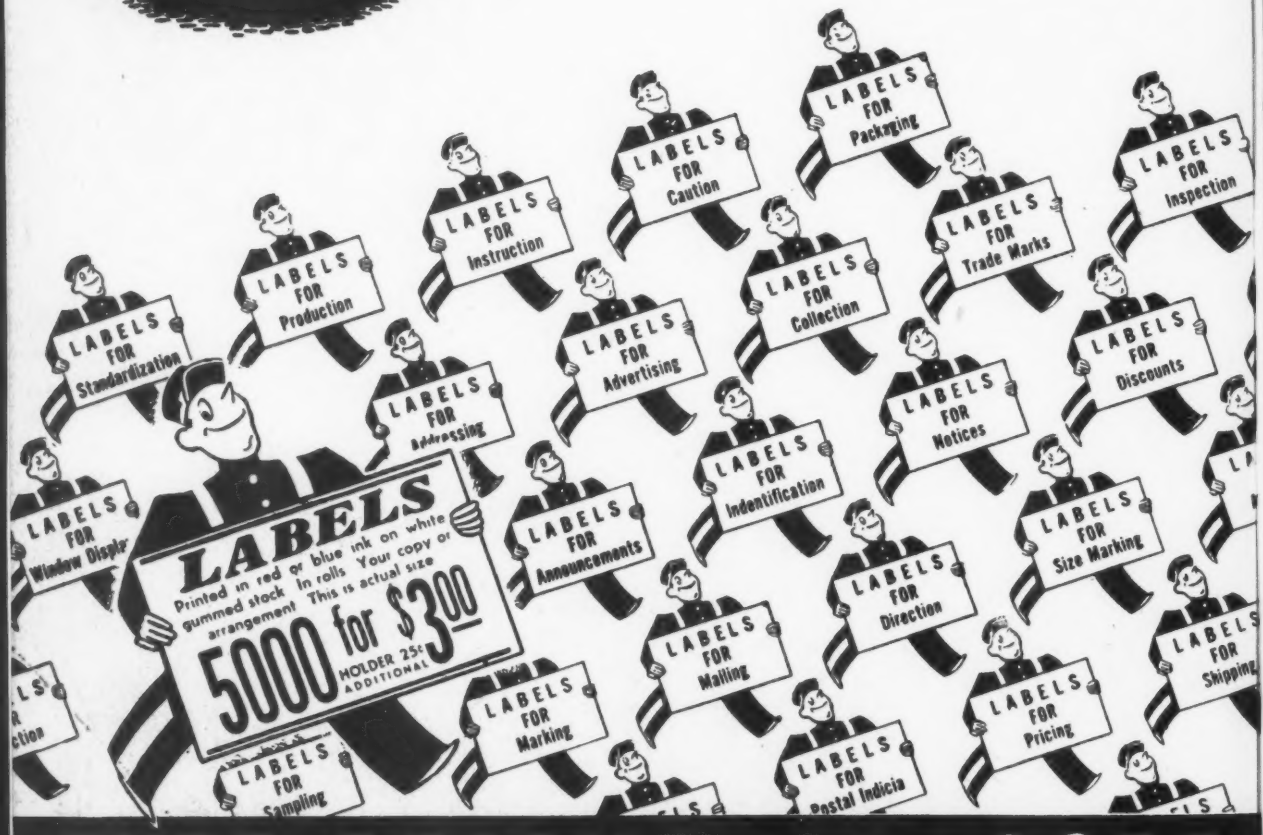
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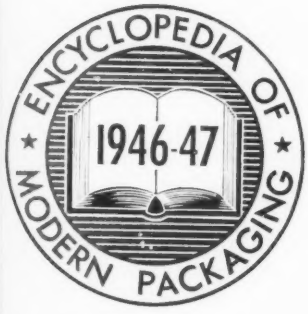


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CANS AND TUBES

Metal Cans 322

Protective Coatings for Metal Containers 325

Can Decoration 327

Vacuum-gas Packing of Foods in Metal 329

Handling Cans on the Production Line 331

Aluminum Containers 333

Fibre Cans and Tubes 335

Paper Containers 337

Collapsible Tubes 340

Coatings for Collapsible Tubes 342

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Metal cans

by Gordon Cole

Can manufacturers believe that 1946 may see a return to normalcy in the can industry. Normalcy means that the American public will open and discard as many as 17 billion metal cans a year—cans which contain as many as 2500 different products. Normalcy means a dollar volume of business estimated at $340,000,000 yearly. During war years, the list of 2500 products for civilian consumption packaged in metal cans was cut by Government restrictions to 93 food products and 50 general-line products, and the can makers' efforts were concentrated largely on the manufacture of hundreds of different cans for war use. Thus, the can manufacturers continued to produce, in the face of tin shortages, almost as many cans as in prewar years.

The major effect of war restrictions was to put some plants out of business as far as civilian products were concerned. At the present writing, it is apparent that restrictions must remain until definite estimates can be made of future tin supplies—how soon and how much tin may be expected from the Dutch East Indies and Malayan Peninsula and how much from South America.

The seriousness of the tin shortage has been offset largely by technical advances made during the war years. As a result of such "know how," very little additional tin is necessary to bring production back to normal—and continuing research will undoubtedly reduce the margin of need even more.

In view of the fact that 52 per cent of the familiar steel and tin cans were drafted for Army use and that civilians have been buying products in substitute containers, the question has often been asked: "What of the future of tin cans?" H. Ferris White, Executive Vice-President of the Can Manufacturers Institute, answered it this way:[1]

> Postwar the industry expects that the people of this country will open and discard more than 45,000,000 cans every day and that we will serve more industries than ever before and that they will pack a greater number of different products. Why this optimism? To choose a few pertinent examples, the per capita consumption of canned vegetables increased 55 per cent in the 15 year period 1925–1940, and the per capita consumption of canned fruits increased 86 per cent during this same period. The consumption of grapefruit juice in cans quadrupled in the period 1935–1940, and the consumption of beer in cans increased 125 per cent in the period 1937–1941. . . . Summed up, it is simply that cans are mighty important to man, and the can manufacturers believe that Man is here to stay.

Construction and manufacture

Cans are made on a series of machines collectively known as a "can line." Sheets of tin plate are first fed into a slitter which cuts them into "body blanks." The body blanks are then fed into the bodymaker where a sequence of automatic operations is performed to complete the cylindrical body of the can.

The first station on the bodymaker notches the body blanks. They are then hooked, and the hooked blanks are formed around a forming cylinder and bumped to form the side seam of the can. The formed body passes over fluxing wheels and next goes to the solder bath where revolving rolls apply solder to the outside of the side seam. The surplus solder is wiped off, and the soldered body cooled by a blast of air before being delivered to the flanger where the ends are curled outwardly by special pilots and dies to form the flanges.

While the can bodies are being fabricated, the ends are also being made by cutting the sheets of tin plate to the proper size with scroll shears and punching the ends out in a punch-press. The ends then pass through a machine which curls the edges inwardly. Curled ends next go to the compound liner and drier where a rubber gasket material is poured into the curl of the end, then dried. The gasket material makes possible an airtight bond between the body and the end when double-seamed or assembled.

After the flanged bodies leave the flanger, they proceed to the double seamer where one end is applied. This operation is essentially the same as that used in the canning factory for sealing on the top of the can. After one end is sealed on, the cans go to a testing machine which, by means of air pressure, tests them for leaks and automatically discards any that are faulty. After testing, the cans are loaded into shipping cartons or directly into paper-lined box cars for shipment. Covers are packed separately in fibre tubes and shipped with the cans.

All these steps in the manufacture of the "sanitary can"—in the familiar No. 2 size or smaller—and yet the finished can costs less than two cents!

The standards of accuracy maintained in high-speed can production lines are incredible to the uninitiated. The size of the body blank can err no more than 0.002 in., and its enamel coating must be in perfect register. The notches at the can ends must be perfectly centered; the side seam hooks cannot vary a hair's breadth. An inspector's report for the bodymaking line alone calls for answers to 48 questions, some requiring as many as 24 measurements.

To present some picture of the scope of the research facilities developed by the can industry, we present several problems which have been met and solved.

In one category are the problems of high speed production—smoothing out the hazards that stand in the way of high-speed, and therefore most economical means of production.

Another branch of can making research is coordinated

[1] See *The Canning Trade*, February 19, 1945, p. 6.

with the steel producers to establish standards for tin plate to meet the requirements of high-speed can production for hundreds of different products. Tin plate can now be ordered in six temper numbers, from the softest for drawn cans, for sardines, to the hardest, for beer-can ends. The most recent example of cooperation between the research departments of can companies and the steel industry is the development of the electrolytically coated tin plate that made possible the vital saving of tin during war years.

Enamels and sealing compounds offered some of the trickiest problems solved by the research divisions. As many as ten different enamels were used prewar to coat cans for foods which might show discoloration in tin alone. Each of these types of enamel represents months of painstaking experimentation to make certain it would have no undesirable qualities and give adequate coverage with a film as thin as 0.0003 inch. During war years, when the industry was faced with the immediate necessity of giving adequate protection to foods encased in cans having greatly reduced tin coatings, hundreds of additional combinations of enameling materials were developed. (See *Protective Coatings for Metal Containers*, p. 325.)

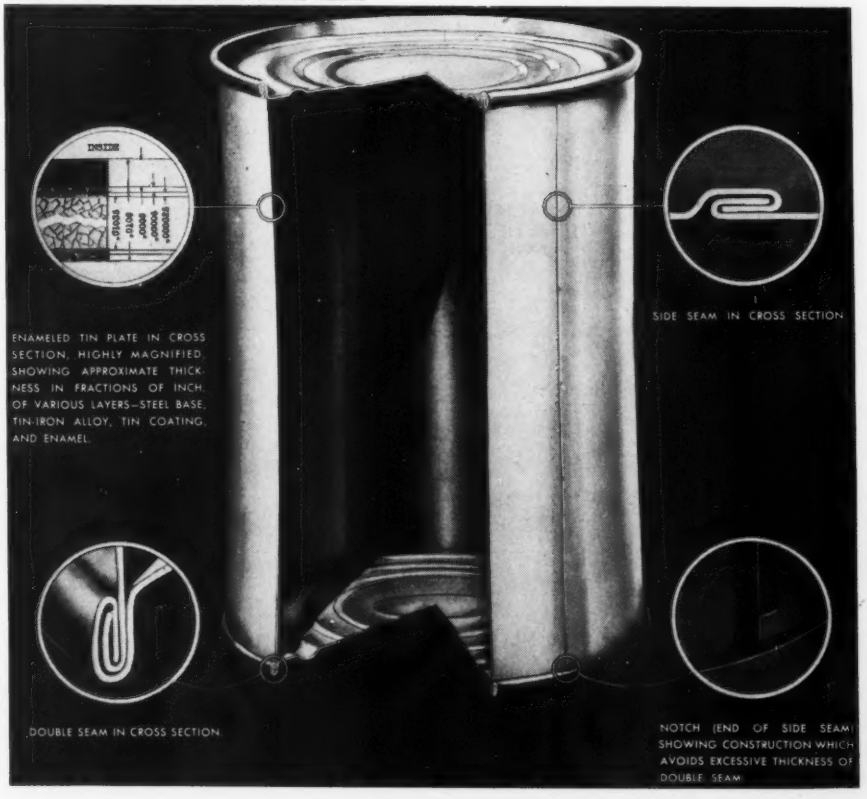
Sealing compounds are even more essential to the perfection of the tin can. If the sealing compound fails, the double seam will leak and the contents will be lost. Sealing compounds, in the same way as enamels, must have properties to fit the product. Each must have the right resistance to water or to oil, to heat, to acid or to fat, to dry vacuum, and so on. Before the war, compounds for packers' cans were made from rubber and those for the general line were made of plasticized shellac, cement and sodate compounds. Synthetic compounds developed early in the rubber-short years cut the use of rubber by 50 per cent and, finally, all natural rubber was eliminated. Results have been so satisfactory it is doubtful if prewar compounds will be used again even when the materials are available.

Still another department of can research concerns itself with problems of the packers. The best container can fail if the product is improperly packed. The can industry has made it a point to investigate all of the reasons why a product might spoil—because of insufficient sterilization time, or can closure with insufficient heat, or fills which are too high—and provide every packer with the information necessary to prevent such mistakes.

The can companies' research divisions are constantly busy exploring new techniques to mprove canned products. They developed the Tenderometer, the first accurate machine for measuring the tenderness of vegetables; they developed the vacuum process of packing whole kernel corn; they worked out a sterilizing formula to prevent the solids in grapefruit juice from settling to the bottom of the can. When petroleum refiners suspected retailers of substituting inferior motor lubricants for standard brands, can industry researchers showed them how to package motor oil in nonrefillable metal containers, at the same time developing a simple and efficient dispensing device.

A method of preserving the pigment in green vege-

ILLUSTRATION BY E. LOWENSTEIN, COURTESY FORTUNE MAGAZINE



The "tin can" has comparatively little tin in its construction, particularly since shortage of the lustrous metal forced the development of electrolytic coating. Highly magnified cross section (upper left) shows the relative thinness of tin coating, and other magnifications show the structural features of what has been called "the closest approach to a perfect package."

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tables was developed by can manufacturing companies' research departments, as was the system known as the "high-short"—high temperature and short sterilization time—to preserve the taste, color and vitamin content of canned foods.

Still another part of can industry research advises canners on such problems as crop control, choice of crops for given areas, seed development and seed selection, growing requirements, insect and disease control, study of new areas brought in by new irrigation projects, waste disposal, and so on.

Styles and sizes

In prewar years, packers' cans were made in a wide variety of sizes from 4 oz. to 1 gallon. Wartime restrictions reduced this variety considerably. General-line containers are varied as to shape—round, square, oblong, oval—and one thousand is a conservative estimate of the number of variations that have been constructed up to the present time.

When restrictions are removed, the matter of simplification of can sizes and shapes becomes a matter for the consumer, distributor, packer and the Government to decide. The can manufacturer has the role of a bystander, armed with statistics, who can tell the manufacturer how much the container he dreams of will cost, and from his experience, what advantages and disadvantages it will have from the standpoint of public acceptance.

At the present time, the subject of simplification of can sizes and shapes is under discussion by a committee of canners with representatives from the can manufacturing industry.

Advantages of the tin can

Product protection is, in almost every case, the prime consideration in the selection of a container. Because cans do not break, crack, chip, split or tear, because they keep out light, air, moisture, gas, dirt and germs and because label information may be lithographed directly onto the body of the can, they serve well as containers for food, beer, drugs, insecticides, paint, oil, tobacco and many other products. In addition, the fact that they are easy to carry, handle, store and to dispose of, has made them as convenient as they are economical to use.

Since 52 per cent of the cans ordinarily handled by the food trade went to war, a recent nation-wide survey was conducted among food brokers, wholesalers and retailers to ascertain the place of substitute containers. According to the tabulated replies, 93 per cent of the retailers preferred cans for soups, 53.9 per cent preferred them for sirups, and preference for cans as packages for other products ranged between. For display purposes, 7.1 out of 10 retailers preferred cans as window displays, and they were the choice of 9 out of 10 for jumble displays. Some 9.3 out of 10 retailers believe that food in cans gives greater value to the customer than foods packed in other containers. Can preference among wholesalers was 9.4, and among brokers 9.3 out of 10 preferred to handle them.

New developments and trends

The electrolytic method of coating steel with tin was developed on a vast scale during war years in the interests of tin conservation. With this method, it is possible to obtain an even coating of tin as thin as 0.1 lb. per base box, as contrasted with the hot dipping process, wherein coatings averaging less than 1.2 lb. per base box are usually unsatisfactory.

The advantage of electrolytic coating from the standpoint of tin conservation was obvious, but the question to be answered was: "How thick a coating of electrolytically applied tin is necessary to prevent the corrosion of cans for each of many different products?" A weight of 0.5 lb. per base was generally applied for the early tests. This weight, and less, was found completely satisfactory for many products. For any wet product, the 0.5 lb. coating was satisfactory only with the addition of protective enamels. For still others, mainly the more acid foods, the hot-dip 1.5 lb. coating had to be continued in order to give adequate protection against corrosion.

To the question, "Is electrolytic coating here to stay?" the answer is, "Yes." At the present time, the extract cost of enamel coating sometimes cancels out the savings effected by this more economical method of tin plating. Many problems are still to be solved by research men of the can manufacturing and steel industries, but in the meantime, electrolytically coated cans in weights which give uniform satisfaction will be used for those products where protection is adequate.

There was a great deal of experimentation at the beginning of the war with can solders. The high tin-lead alloy used before the war has been replaced in most instances by low tin-lead compositions found to create an even stronger solder bond. The low tin-lead solders, as well as the new lacquers and sealing compounds mentioned earlier represent wartime advances which will continue to be used by the industry.

These are a few of the noteworthy trends from the standpoint of materials. On the credit side of the war ledger, too, was the development of can packaging techniques for the many types of war equipment and products never packaged before. Of great significance to the container industry as a whole was the vast-scale testing of packaging materials for military use—and the trial of these packages under actual handling and climatic conditions heretofore unknown. The tin can covered itself with glory as a protector of food, weapons, delicate machinery, chemicals, drugs and medicines under the most difficult conditions. And now, at the beginning of the new era of expansion—an era which, according to forecasts, will see the doubling of consumer spending power—the can industry prepares itself for great expansion, to package hundreds of new products.

Protective coatings for metal containers

by J. H. McKenzie

Can enamels are especially formulated varnishes and lacquers designed to protect the appearance and quality of food and industrial products packaged in metal containers. Probably the first interior coating of this nature to be used was the so-called "sanitary enamel"—developed in the early 1900's for protecting certain acid foods. During World War II, enamels assumed added importance in prevention of both interior and exterior corrosion when tin conservation measures were adopted.

In discussing protective coatings for metal containers, the subject logically divides itself into two main classifications: 1) interior coatings, and 2) exterior protective and decorative coatings.

Interior coatings

When compared to the performance ordinarily expected of a varnish or lacquer for industrial usage, the requisites of can enamels are exacting. For example, enameled cans are used for red fruits to preserve product color and for beer to retain its flavor and clarity. In some instances, such as for fish and meat products, where sulfide staining or "spangling" of the metal is objectionable from an appearance standpoint, interior coatings serve to enhance the sales appeal of both the product and container. It should be noted, however, that in no instance do these chemical reactions affect the wholesomeness of the food.

For the interior of food containers, coatings 1) must be nontoxic and taste-free, 2) must not soften, disintegrate or lose adhesion when subjected to food processing temperatures, 3) must resist the chemical action of food acids and essential oils, 4) must bake out in a few minutes time to a continuous, thin, abrasion-resistant film possessing sufficient flexibility and adhesion to withstand high-speed metal stamping and forming operations.

For an interior can coating, it may be said that flexibility and complete film continuity are the most important factors in the protection of acid foods, while moisture impermeability and resistance to long high-temperature sterilizing processes are prime requisites in the protection of more neutral products.

The same general specifications required for food protection must also be met by interior coatings for the protection of industrial products. One point to note is that taste characteristics and resistance to high thermal processing temperatures are not important factors. Special requirements, however, such as solvent and alkali resistance are required in many instances.

As can readily be seen from the above specifications, fundamental research and laboratory control play an extremely important part in maintaining quality performance. Commercial adoption of a new material for the interior of processed food containers, for example, usually requires several years due to the complicated nature of the tests involved and the care which must be exercised in meeting all qualifications. After subjecting the new development to critical laboratory scrutiny, a number of trial cannery packs are usually made. Upon commercial adoption, each batch of coating and raw material is checked to be sure that uniformity and quality is at all times maintained.

Exterior coatings

Among exterior can enamels are included the colored coatings, varnishes and inks employed as both protective and decorative finishes on the exterior of containers. For the prewar grades of hot-dipped tin plate, these were mostly of a decorative nature. However, during the "tin conservation" years, they have served primarily as protection against corrosion on both untinned steel and electrolytic plate of lower tin coating weights. Hundreds of thousands of gallons of olive drab and camouflage coatings were used on metal containers during World War II for prevention of corrosion in overseas shipment, as well as camouflaging the bright tin surface in field operations. Now that cans for nearly all products for civilian consumption are permitted, colored finishes and varnishes are available to decorate containers and promote sales.

Raw materials

In 1941, it was realized that many substitutes and changes in formulation would have to be made in the oleoresinous coatings, because the majority of these contained imported fossil gums, China wood and Perilla oils. During the war, constant reformulation was necessary, due initially to the shortage of imported materials, and later to the increasing demands of the armed forces for the domestic chemicals used to manufacture synthetic resins and oils. Dehydrated castor and treated linseed oils soon replaced the oriental imports, while phenolic and petroleum resins were substituted for the fossil gums.

The successful performance of these substitute coatings during the past five years is a tribute to the ingenuity and technical skill of the laboratories of the metal container and coating manufacturers. Many substitutes have since proved to be superior to the prewar materials, and with the availability of the new resins, oils and pigments, an even further improvement in protective and decorative coating quality is anticipated.

Alkyds, melamines, urea-formaldehyde and modified vinyl coatings are currently employed as varnishes over

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lithographed work to prevent marring and abrasion, as well as to produce a glossy and attractive appearance. Varnishes for such decorative work must also resist discoloration or aging under a variety of storage conditions. When employed on decorative designs on containers which are subjected to thermal processing or pasteurization, adhesion, thermoplasticity and resistance to greases are very important.

Pigmented exterior coatings, usually employed as a background for most lithographed work, are formulated from resins and oils similar to those used for varnishes. The general characteristics discussed above are also desirable in these coatings.

Many metal container parts are still being fabricated from untinned steel, commonly called "black plate." This type of metal is principally used on the ends of cans for such products as motor oil, coffee, antifreeze mixtures and paints as well as for some nonprocessed foods. In the form of chemically treated (Bonderized) steel, it has been employed in large quantities on the ends of cans for a number of processed vegetable and meat products. Either clear or aluminum-pigmented coatings of the alkyd or oleoresinous type are now being applied to protect the steel from corrosion, and considerable progress has been made in recent years in improving coatings for this purpose. In some instances, the lacquered steel has proved superior to the plain tin plate or terneplate formerly used.

Interior coatings for thermally processed and nonprocessed foods are, as a rule, especially formulated oleoresinous or vegetable oil modified synthetic enamels. They have found wide use for the protection of such products as cherries, prunes, pumpkin, citrus juices and the like. Since plain electrolytic tin plate does not provide adequate interior corrosion protection for processed foods, application of organic coatings has been greatly expanded during the war to include a wider range of fruits and vegetables such as peaches, pears, tomatoes and similar produce. In some instances, there are indications that the inside-enameled cans made of conservation plates exhibit a longer shelf life than plain cans made of prewar tin plate. Enamels for lining containers for certain types of sulfur-bearing foods such as corn, peas, beans, seafoods and meats are of similar formulation with the addition of zinc oxide to prevent sulfide staining or spangling of the metal. Due to their impermeability, heat-polymerizing phenolics also have found wide application for the protection of certain products in this classification, particularly seafoods. The advent of the beer can introduced the vinyl type of lacquer to the can manufacturing field. Vinyl lacquers have since found further application in lining cans for such specialties as apple juice, lemon juice and many nonprocessed specialties.

In the field of industrial products, the problems of general atmospheric rusting and chemical resistance are of primary importance. The type of enamel employed depends largely on the moisture content of the product and the type of container specified. Vinyl and phenolic lacquers have met with considerable success in this category, particularly where alkali, solvent or essential oil resistance are problems.

Coating and baking operations

The success of any interior or exterior container coating is dependent upon film continuity, thickness and the baking cycle. With the exception of a few special containers where spray application is employed, all can enamels are applied on the flat metal sheets by roller coating. In some instances, strip steel, rather than the undecorated sheet, is coated in this manner.

In the conventional roller coating machine, the coating is picked up from a reservoir or fountain by means of steel transfer rolls and thence transferred to a glue-glycerin composition or rubber roller. The metal sheet contacts the latter in passing through the machine. The film thickness is controlled by micrometer adjustments of the steel rollers. Where can bodies are to be soldered, a plain tin margin must be left on the coated sheets. To accomplish this, appropriate sections are cut out of the composition rollers, so that no coating is applied at these points.

After the sheets leave the coating machine, they are baked in steam or gas fired convection ovens to remove solvents and cure the resultant enamel film. The actual baking time and temperatures employed are dependent upon the materials used and normally vary from 225 to 450 deg. F. for 5 to 20 minutes. For many synthetic coatings in current use, however, cure is effected through polymerization and more accurate control of curing cycles has become necessary. Film thickness, as well as proper baking also plays a very important part in fabrication and performance.

After the stock is enameled, it must be carefully directed through all manufacturing sequences to avoid scratches and exposure of bare metal. Proper lubrication of the plate is an important function in these operations and greatly reduces the scratches occurring during the punching of can ends and forming of the bodies. Lubrication is usually accomplished by addition of "slick" compounds to the enamels themselves, or by spraying the sheets as they emerge from the baking ovens with minute droplets of molten paraffin.

New developments

Improved drying oils, as well as many oil-modified and straight synthetic resins have recently appeared on the market. The polystyrenes, vinylidene chloride resins, silicones, acrylates and petroleum-derived resins also offer possibilities as container coatings. Finishes with new and interesting properties have been obtained by blending such film-forming resins as vinyl chloride-acetate copolymers with other types of resin. The extent to which protective coatings will continue to be used on containers which were formerly made of plain plate will depend largely on the economics and performance of enameled steel or electrolytic stock.

Can decoration

by W. P. Murray

The Smithsonian Institute in Washington, D. C., is in possession of a metal cookie box, the cover of which is considered one of the finest specimens of metal lithography in existence. The subject of the reproduction is Gilbert Stuart's famous portrait of George Washington. Thirteen colors were used to bring out all the subtleties of tone and hue found in the original. Yet, a duplicate of this museum piece has been made with only seven colors. Placed side by side, no one would hesitate to name the second the better. The difference is not one of craftsmanship, but of technique. The first one was done by the old method of stone reproductions; the second, by the modern photographic process.

As in many other industrial arts, metal lithography has developed and improved through the constant interplay of two factors. One is skill in craftsmanship, human "know-how" that is acquired over the course of years; the other is advancement in technology, representing mechanical, chemical and other developments that slowly improve and often revolutionize the basic tools of the trade. A third factor—not seemingly a part of this thought and yet fundamental to it in a business sense—is merchandising effort.

It must not be forgotten that high-quality lithography is actually and essentially an art. From the time an artist makes a sketch of a color design to the time that the plate is etched, finished and ready for the press, human skill and judgment are the deciding factors between a good and an inferior job. This is particularly true in such highly specialized and complex operations as designing, photography, plate making and color mixing. In the final analysis, a piece of metal lithography is no better than the skill of all the craftsmen through whose hands it has passed.

Any manufacturer of a consumer product who considers changing to a specialty container does so because he wants to take his product out of staple category and put it into the luxury class. He may have several reasons for wanting to do this. His product may have a "class" appeal and therefore require distinctive packaging. He may want to create a special appeal for one line of products so that it will become a kind of marketing bellwether for others. He may want to take advantage of seasonal markets, such as Christmas, or he may want to create a gift item.

In any case, a richly decorated metal container will glamorize his product and add a new and important sales factor. Many such containers are not thrown away after their contents have been used up. They are saved, often for years, to be converted into containers for various household and personal effects. Thus, the consumer is willing to pay a higher price because he is making a two-way buy—the product plus the package. Although richly embellished metal specialty containers are relatively more expensive than most other forms of packaging, the distinction they give a product frequently is as valuable as an old and established trademark. It is not surprising, therefore, that customers frequently become exceptionally exacting regarding even minor details of color and line.

In the early 20's, a large packing company put on the

PHOTOS 1 AND 3, COURTESY CONTINENTAL CAN CO., INC.



1—Reproduction of the Stuart portrait of Washington on this cookie box is a duplicate of a museum piece of lithography, done years ago on stone with 13 colors. With the modern photographic method, only seven colors are used and the work is inexpensive enough to make a commercial package—yet experts say the modern job is better.

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PHOTO, COURTESY J. L. CLARKE MFG. CO.

2—For a container that is handled a great deal and must be kept as a receptacle, metal is ideal.

market the first finely decorated Christmas box, containing a combination of food products. The box, measuring $12^{1}/_{4}$ by $10^{13}/_{16}$ by $6^{13}/_{16}$ in., had reproduced on its four body panels color scenes showing various vistas of the beautiful Mohawk Valley. The cover itself was the skyscape reproduced from a painting by Edward Gay. Considerable quantities of these containers were needed. However, it had been the opinion of informed people in the trade that the job could not be done commercially because of the fineness of the decoration and the number of colors to be printed. Not only was this job successfully undertaken, but larger quantities were ordered from year to year as the demand for the package grew. This was the first box of its kind ever sold and used for such a purpose and it created a vogue which lasted.

Another job had to do with an internationally known cosmetic and beauty preparation house. After the first World War, this organization came into the American market from England, but for years continued to buy all its lithographic metal containers abroad. These people were confident that no facilities existed in this country to produce the quality of lithography on which they insisted. After long persuasion, they agreed upon a trial run. When the job was finished, our American craftsmen had done such a splendid job that the English company agreed that it had never seen finer lithography. It is interesting to note that the engraving and printing plates for this job, seemingly a very simple one, cost more than $1,200. These people were so particular that on many occasions they changed the plates at costs of $500 to $600 to improve minor details.

To a manufacturer who has never experimented with fine lithographed containers, the very problem of selecting proper designs and colors may seem challenging. "What do I know about art?" he may ask. "How do I know what kind of decoration would sell?"

Naturally, this is a fairly common experience, and metal lithographers are well equipped to meet it. In the first place, their art departments have skilled artists and designers who can take an ordinary label—or just an idea about the product—and know how best to present it. Secondly, a vast amount of experience and marketing research has accumulated on this subject and in many cases consumer preferences regarding color and design are already known.

Of course, question now arises as to when specialty containers will again be available. The industry is still beset with shortages of materials, but a few lines are already in production and the manufacturing tempo will steadily increase after the first of the year. A considerable backlog of orders exists and many customers are considering coming out with new postwar designs—a factor that exerts considerable pressure upon art and design departments. Nevertheless, the industry is committed to the task of meeting all demands.

Certainly the next few years will see a tremendous increase in the use of decorated metal containers. The public is weary of the drab packaging which, of necessity, characterized the war period. Secondly, we are now facing an era of unprecedented competition and any sales factor that can be added to a product will be seized upon avidly. Finally, metal has proved to be one of the best materials for packaging protection.



3—The containers shown here make an impressive illustration of some of the styles and uses for lithographed metalware. All of these designs have been reproduced in several different colors.

Vacuum-gas packing of foods in metal

by R. Royce and C. L. Beardsley

The purpose of the vacuum-gas packing operation is to produce a package having a low oxygen concentration in the enclosed gases With many foods, exclusion from contact with oxygen is desirable to prevent oxidative and similar changes affecting flavor, odor, appearance, general palatability and nutritive value during storage. The most common deteriorative change which vacuum-gas packing is used to control is oxidative rancidity in fat-bearing products. Other harmful effects from contact with oxygen which packing in inert gas inhibits are widely divergent in character and include among other dangers, oxidation of vitamins, carotene (A) and ascorbic acid (C), as well as darkening from oxidation of food pigments. In addition, insect growth in cereal type foods can be eliminated through gas packing.

The principle of vacuum-gas packing has been in commercial use on dry products for a good many years. It has had a definite place in the merchandising of several types of food products, particularly whole milk powder, dry milk-based infant food formulas and others of this kind.

Briefly, the vacuum-gas packing operation consists of removing the atmospheric gases from a filled container by means of vacuumization, then dissipating the vacuum with an inert gas and hermetically sealing the container. In general, then, one may say vacuum-gas packing, commonly called just "gas packing," is the replacement of the air in an hermetic type of container with an inert gas. (See *Hermetic, Vacuum and Gas Packing*, p. 48.)

Other methods of obtaining lowered oxygen content by air replacement include flushing containers filled with a dry food material with an inert gas to displace the air from the interstices, and then displacing the air from above the surface of liquid or semisolid products just prior to closing the cans. However, these methods have their limitations for general use and, broadly speaking, are not commercially interchangeable with good vacuum-gas packing procedures. Regular vacuum closure is often used on succulent products that are to be preserved by heating, and closure under high vacuum is employed for some dry packed products such as coffee. The vacuum packing method of obtaining low oxygen tension in dry food materials is limited to containers of a size and shape capable of withstanding the pressure of the atmosphere. The use of gas packing eliminates the danger of container distortion by substituting inert gas for vacuum in the finished container, thus balancing the external atmospheric pressure. The limit on the size of containers which may be employed for gas packing is determined only by the means of handling them and making them hermetic following the gassing operation.

Limitations on the use of the vacuum-gas packing operation are twofold. First, the speed of handling when using this procedure is generally less than the straight hermetic or vacuum packing operations. Second, equipment and labor costs when packing by this method tend to be slightly higher than for vacuum or normal atmospheric closure. The cost of the inert gas itself cannot usually be considered as a major factor in the added cost of the method.

Commercial installations

Commercial installations are in operation on both a continuous and an intermittent basis. Continuous units have the disadvantage at present of very low oxygen contents not being obtained consistently. On the other hand, commercial operation of boxes on an intermittent basis produces containers having oxygen content as low as 0.5 per cent An intermittent gas packing unit consists of a cover-clinching machine, gas boxes with vacuum pump and inert gas manifold and a closing machine for sealing the vacuumized and gassed cans.

The efficiency of a gas packing operation depends upon three things: the completeness of the vacuum which is drawn; the tightness of the box; the purity of the inert gas used. For each inch of difference between the vacuum in the box and the barometric pressures, 0.7 per cent oxygen in the final container can be expected. In other words, if the vacuum drawn by the pump is only 28 in. of mercury and the barometric pressure is 30 in., 1.4 per cent oxygen can be expected to be present in the container after gassing, plus any oxygen contained in the inert gas itself and that diffused into the can after removal from the box and subsequent to final sealing. Good commercial installations have vacuum pumps which can reduce the pressure within the gas boxes to 0.04 in. of mercury, so that oxygen values in the containers immediately after packing are practically equivalent to the purity of the bottled inert gas itself. The qualification, "immediately after packing," is made because some products, notably spray-dried whole milk, show a build-up during the first few days of storage in the residual oxygen content of the free gas surrounding the product. This phenomenon is discussed in more detail further on in this article.

The tightness of the gas box is of great importance. Door gaskets should be checked frequently for tightness of seal and replaced when deteriorated. Valves should be vacuum-tight; a packless type or a type which can be grease-lubricated can, as a rule, be maintained better on high vacuum service without leakage than other types of valves. All gas lines and vacuum lines should

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be welded rather than assembled with pipe fittings. It has been found that even very tightly threaded joints frequently loosen up during constant usage from slight vibrations induced by the action of the pumps or other equipment.

Two methods of closure are in use on gas packed containers. In the clinch closure method, the cover is loosely clinched on the can body before vacuumizing and gassing and, after removal of the can from the gas box, the seam is finished. In this method, the air is withdrawn and the inert gas enters through the open clinched seam. The other method consists of completing the seaming operation, then punching a hole in the cover and vacuumizing and gassing the can through this hole. After removing the cans from the gas box, the holes are soldered to complete the seal. Both methods have their advantages. Clinch closure is easier to adapt to automatic closing equipment while the vent-hole type closure shows smaller diffusion losses of inert gas between removing the cans from the box and sealing them. For rapid commercial handling, this latter objection to the clinch type closure is not significant enough to be of importance.

Both nitrogen and carbon dioxide gases are used for commercial vacuum and gas packing, separately and in combination. Of equal purity, bottled carbon dioxide gas is somewhat cheaper than nitrogen. However, since carbon dioxide dissolves in fats and water, it is not practical to use this gas undiluted with products containing substantial percentages of fat or moisture. Solution of the packing gas creates high can vacuums and results in distortion of the larger size cans. If a container of whole egg powder, for instance, were packed under pure carbon dioxide, more than half of the carbon dioxide would be absorbed, resulting in a high vacuum after equilibrium had been reached. If a 50–50 mixture of nitrogen and carbon dioxide is used, marginal equilibrium vacuums are created in high-fat foods. A mixture of 25 per cent carbon dioxide and 75 per cent nitrogen by volume can be used successfully for fat-bearing products.

The oxygen content of carbon dioxide commonly supplied is about 0.1 per cent while that of nitrogen is about 0.3 per cent. Purer nitrogen can be obtained at an additional cost, but the slight advantage gained is not worth while commercially.

Food products for which gas packing is used

Experience has shown that whole egg powder retains its normal characteristics to a better degree when inert gas-packed. The inert atmosphere protects the fat from oxidative rancidity and aids in retention of Vitamin A. Nutmeats, Chinese noodles, potato sticks, etc., also need protection against oxygen because the oils present are susceptible to the development of oxidative rancidity. Dehydrated cabbage and carrots have been packed in an inert atmosphere to preserve Vitamins C and A, as well as to assist in better retention of the original flavor.

Spray-dried whole milk powder presents a specific problem which is not encountered in gas packing any of the aforementioned products. The spray-dried powder consists of a mixture of solid and hollow spheres of milk solids, with the hollow particles enclosing minute quantities of air. When this product is gas packed, the initial oxygen content as determined immediately after packing tends to increase during storage by the amount of oxygen evolved from these hollow spheres. The final oxygen content, therefore, depends not only upon the initial oxygen content, but also upon the amount of oxygen which can diffuse from the particles. Four methods of improving this situation have been found. First, the number of hollow spheres in the powder should be kept at a minimum by constant control of influencing factors in the processing and drying operations; second, the powder may be pretreated by holding it under vacuum or under inert gas before gas packing (patented procedures); third, the hollow particles may be ruptured before packing; and fourth, the powder may be spray-dried in an inert gas. The first two methods are commonly used while the latter two methods have not been used on a commercial scale up to the present time.

Cereals, flour, popcorn and other products of this nature have been packed in an inert atmosphere to protect against weevil growth. Samples of flour inoculated with weevil larvae and eggs and packed in inert atmosphere showed that growth was fully inhibited under the low oxygen tension. Similar samples sealed in air permitted growth of the insects to all stages of development before the quantity of oxygen in the can was consumed.

Future possibilities

During the war years, vacuum-gas packing played an important part in the preservation of foodstuffs sent overseas. Those in charge of planning and developing rations and those in charge of procurement were quick to realize the importance of this procedure in helping maintain the high quality of the overseas rations for our troops. Thus, wartime requirements have helped prove the advantages of vacuum-gas packing of many foods to withstand the rigorous conditions imposed by the distribution and storage of food products throughout the expanse of the globe for feeding our armed forces.

Future usage of the vacuum-gas packing method may, therefore, be considerably increased over prewar levels. Not only the quantity, but also the variety, of foods packed by this method for both domestic and export deliveries may very well be expanded because of the excellent results from use of the method for food products procured by the Army and Navy. Furtherance of use of the vacuum-gas packing method, and increasingly improved results from its use, should result from continued research carried out by numerous branches of the food, container-manufacturing and related industries.

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Handling cans on the production line

by Fred C. Baselt

In general, the handling of metal containers by canners simply calls for the exercise of good judgment and common sense. This is true for metal containers made in peacetime and for containers made when conservation of strategic materials must be observed.

The metal container, or, to use the more familiar nomenclature, the can, is made of sheet steel (approximately $^1/_{100}$-in. thick) which is usually coated with tin and sometimes with an additional coating of enamel. The materials and structure give the can many inherent advantages. It is ideal for high-speed operation, it is lightweight, moistureproof, vaporproof and lightproof and permits high process temperatures. It is available in a wide range of sizes, it is economical, will not break or tear and its character is well known to the public. Little may go wrong with a tin can which cannot be prevented with care. For greatest success:

1. See that the containers are not dented, bent or mechanically distorted so that an hermetic closure is not prevented or damaged.
2. Avoid the occurrence of rust or corrosion. Temporarily the industry is using wartime and reconversion period packages which, while performing satisfactorily, do not offer quite the same latitude as a prewar can in respect to corrosion. These cans demand adherence to the fundamental principles of good canning.

Handling of cans is such a simple operation and the rules so few that the troubles incurred are generally due to gross neglect and extreme liberties. The contingencies which will be outlined here, it must be stated, are conditions which rarely prevail and represent exceptions rather than routine. The suggested precautions should eliminate these exceptions.

Empty cans—Tin plate has excellent rust resistance under all ordinary conditions. However, under extreme changes in temperature, from cold to hot, condensation or sweating may occur. Moisture in this form can rust the container. For best results, storage temperatures should be uniform and humidity should be low. In other words, the storage room should be properly heated and ventilated. The storage room or warehouse should, of course, be kept clean and the cans protected against dirt and dust, bearing in mind that the can will be used as a container for food.

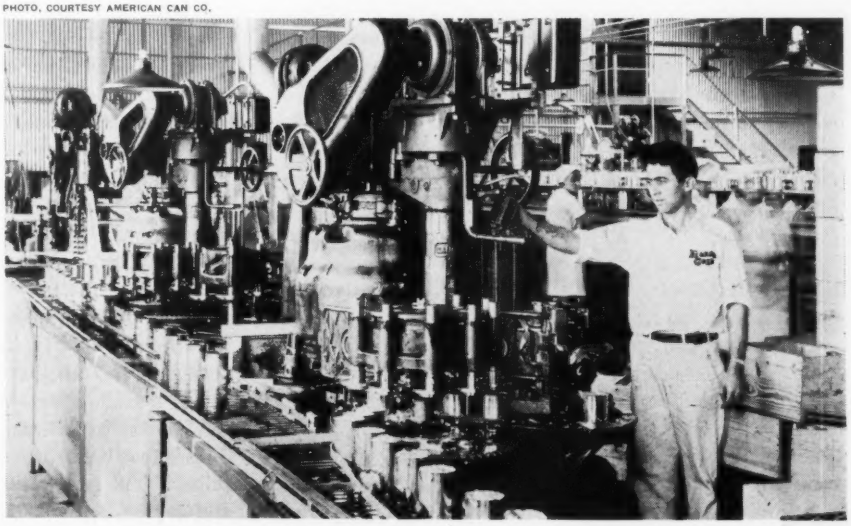
When empty cans are shipped to the packer they are usually handled in one of two ways. When shipped in bulk they are forked into the runways directly from the car. When shipped in bags or cases they may be unloaded by hand and fed into the can lines.

Can handling equipment should be properly designed to prevent scratching or marring of the can surfaces since any point at which the surface coating is abraded is a potential area for rusting.

Filling and closing—Cans are washed with hot water before they are filled. The interior of the can must be as clean as a food utensil. This is generally accomplished with high velocity sprays just before the filling operation.

Errors in filling should be avoided. It is good practice to allow a reasonable headspace. Some headspace is necessary and the air from this headspace should be exhausted so that a good vacuum is established in the can. The method of removing the air from the headspace will vary with each product. Too great a headspace generally permits the trapping of so much air that internal corrosion of the container is accelerated. When an exhaust box is used, it is important to maintain the temperature in the box above 205 deg. F. since below this temperature the conditions are favorable to rusting.

PHOTO, COURTESY AMERICAN CAN CO.



Factory operation showing the line of filled cans going by conveyor to the sealing machine, where the lids are sealed on, 150 per minute.

Faulty closures lead to warehouse troubles. Not only is the can with the faulty closure lost, but often the surrounding cans may also be damaged.

In certain instances, notably with citrus products, the juices from one container may cause perforation in the neighboring one, setting up a continuous process.

Cans should be coded to show not only the product but also the date and preferably the time of packing. The oftener the code is changed, the easier it becomes to isolate lots when necessary. When an embossed code is used, care should be taken since sharp or misaligned type may cause fractures of the tin or enamel coatings, leading to internal or external corrosion. In general, ink marking devices are preferred and with this type of code marking, phenol inks should be avoided.

Cans should be washed after closing. This is particularly true when brine, acid, sugar, or grease is involved. Some residues remaining on the can would induce corrosion. The best washing procedure involves high pressure jets playing on the cans as they leave the closing machine. Hot water is often necessary.

Processing and cooling—When boiling water processes are used, it is important that the water be actively boiling since water below the boiling point can contain enough oxygen to promote rusting.

Elimination of air from the retorts is important for the same reason, and proper venting during the come-up time and bleeding during the process are important not only from the angle of corrosion but also for the safety of the process. Air in the retorts can frequently be the cause of understerilization.

Rust promotes rust and sometimes rusty crates can cause discoloration. This is known as "steam burn."

The chemical composition of the water used in processing and cooling may be a factor in the production of rust. When waters have a high natural alkalinity, they will attack tin surfaces during boiling water processing or pressure processing carried on under water. The tendency of these waters toward detinning will etch or "spangle" the container and will result in a condition which may lead to rust during storage. Should the waters contain quantities of chlorides and sulfates, the iron base may be attacked and rusting may take place.

Similarly, corrosion may be induced with alkaline waters, with high chloride and sulfate waters, and slightly acid waters which are used for cooling purposes. Aside from the chemical content of the waters, the time of the cool and the temperature of the waters may be influential. As the temperature rises, an attack from such corrosive waters is accentuated. If the waters are warm then it is obvious that cans must be left longer in the waters to cool them and this gives additional time for unfriendly substances to work on the container.

Harmful salts dissolved in the water are deposited on the can as the container dries, with a consequent prospect of corrosive action when enough moisture is again present to allow a reaction. These salts are apt to accumulate moisture from the air when the humidity is high. It is, therefore, possible for corrosion to take place during storage. With waters of this type it is highly important to drain the water from the cans as completely as possible. It is also desirable, when a limited supply of noncorrosive water is available, to use this noncorrosive water for a final dipping or spraying operation to wash off corrosive residue deposited in previous processing. Steaming the cans immediately after cooling with carefully arranged steam jets is also an effective way to remove much of this corrosive material.

Problems which derive from the use of alkaline or corrosive waters usually demand special treatments to correct each particular water supply. Thus, if there is any indication that the water supply may be responsible for rusting, a laboratory analysis should be made.

Cans should be cooled rapidly after processing, leaving just enough heat in the containers to dry them and prevent rust. Cans should never be cased when under 95 deg. F. because the heat retained in the cans is insufficient to evaporate the residual moisture on the can surface and rusting may occur. On the other hand, if the average temperature after water cooling is greater than 100 deg. F., there is danger of flat sour spoilage or early hydrogen springer formation, depending upon the nature of the product. In addition to providing for evaporation of residual water by allowing some heat to remain in the cans, water remaining on the cans after cooling should also be removed mechanically as far as possible. This may be done by tipping the retort crate after it comes from the cooling tank and allowing it to drain for a short time or by removing the cans from the crate and stacking them on their sides. A combination of draining and stacking provides the best protection.

Storage—Cool storage will markedly lengthen the shelf life of the container and maintain the quality of the product. Uniform temperature and low humidity are important in order to prevent sweating.

Filled cans should be handled carefully lest they become dented and, though still containing wholesome food, suffer in appearance.

Can handling equipment should be inspected to eliminate all points at which scratching, denting or abrasion can occur.

Wood cases made from green lumber cause what is known as "shook rust." Lumber should not contain more than 15–17 per cent moisture or a situation leading to "shook rust" will be encouraged. Fibreboard cases may also cause rusting if the board is damp.

Salt water spray or salt water is particularly corrosive and this point is an important one to remember when warehouses are located near a seacoast. Salt water must be removed from the cans and in some cases it is necessary to treat the cooling water by chemical means.

Label plates, due to their hygroscopic nature, have been known to give trouble. The packer should make sure that the labeling paste or glue is suitable.

The warehouse storage temperature is a very important factor in determining the quality of the product. This is true regardless of the product and the size of container. The canner must keep his finished product cool and dry.

Aluminum containers

by W. S. McArdle

Usefulness of aluminum for containers has expanded in many directions. Aluminum containers now range in size from tiny tubes less than 2 in. in length up to carboys, barrels and other bulk containers. They include such types as semi-rigid walled containers, and heavy-walled jars, bottles, etc., used for pharmaceuticals and cosmetics.

Extruded containers

Small aluminum containers, such as collapsible tubes, are produced by impact extrusion. An aluminum slug is placed in an extrusion press where a punch (with a maximum diameter equal to the inside of the tube) hits the slug with such force that the metal "squirts" upward around the punch to form the skirt of the tube.

The blow which forms the skirt also forms the shoulder and neck of the tube in the bottom of the die impression. As the punch is withdrawn, the tube is stripped off and another slug is placed in the die cavity. From the extrusion press, the tubes are taken in rough form to a trimmer where the ends are trimmed to the desired size and the neck sized and trimmed.

Aluminum hardens when it is cold-worked, as is the case with extrusion and, in order to give the tube the desired folding qualities, annealing is necessary. This is done just prior to printing and decorating, and it serves a twofold purpose: not only does it make the walls of the tube fold properly, but it also cleans the surface and rids it of oil and grease.

Standard enameling or printing rolls are employed for aluminum tubes. The annealed surface of the aluminum takes printing and decorating well. Words and decoration are sharp and distinct.

Principal advantages of aluminum collapsible tubes are their light weight, nontoxic properties, ability to take and hold decorations and their relatively low cost. Light weight is of particular importance. Since aluminum has a specific gravity of one-third to one-fourth that of other materials used for collapsible tubes, tubes made of aluminum can be packed and shipped safely in light corrugated cartons, which reduce shipping costs.

The hardening effect of cold-working on aluminum is utilized to good advantage in the forming of the crimp when the tube is closed. The folds of the crimp are so stiffened in this folding-over process that it is generally possible to use the aluminum tube without the use of end clips.

Although most products are suitable for packaging in plain aluminum tubes, there are certain products which are not suitable because of their chemical action on aluminum. For the latter, interior protective coatings have been developed. One of these is a synthetic coating requiring a high-temperature bake for curing; another is a compounded blended and tempered wax coating that does not require a high-temperature bake. Wax coatings are applied by flushing the aluminum collapsible tube with the wax blend. The temperature varies with the wax.

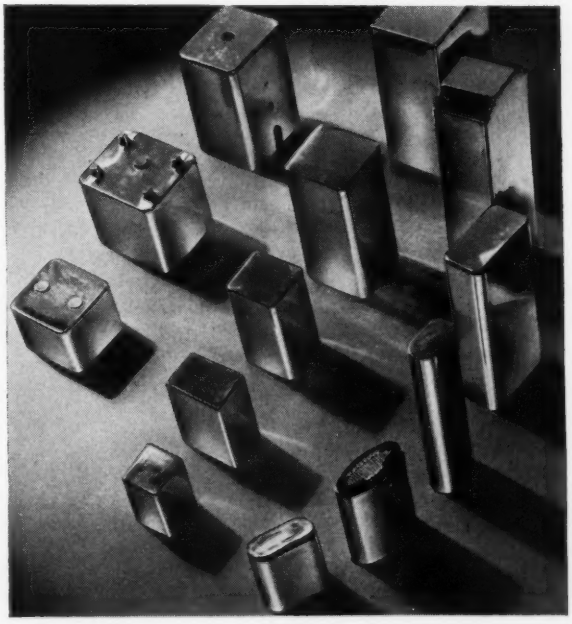
Generally speaking, plain aluminum collapsible tubes have been found suitable for the following products: brushless shave creams, neutral cleansing creams, nourishing tissue creams, deodorizing creams, liquefying facial creams, vanishing facial creams, make-up remover creams, vitamin skin creams, nail polish remover, vitamin ointments, permanent wave creams, lubricating jellies, wax type depilatories, neutral tooth pastes, rouge paste, facial paint paste, neutral pharmaceutical balms, petroleum base ointments, neutral sunburn balms, eye preparations, lubricating grease, etc.

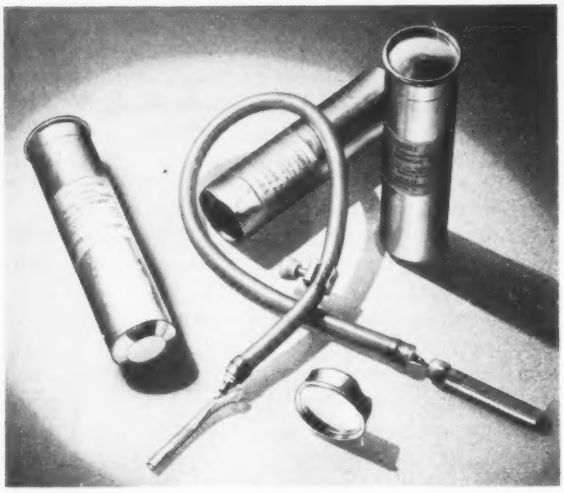
Products requiring interior coated aluminum collapsible tubes include: brush type shave creams, tooth paste (acid or alkaline), astringent creams, antiseptic ointments, pharmaceutical ointments (acid or alkaline), mercurial ointments, contraceptives, facial mud masks, mechanics' soft hand soap, cold creams (facial), mascara, vitamin ointments, shampoo creams, shoe polishing creams, glues, detergent paint cleaners, prepared cheese spreads, prepared fish spreads, prepared butter spreads.

Numerous types of nozzle or applicator are available for use with aluminum tubes. "Fish-tail ends" are employed to extrude thin ribbons. Specialized ends are

1—Here are various types of rectangular, oval and odd-shaped containers made by impact extrusion.

PHOTOS, COURTESY ALUMINUM CO. OF AMERICA





2—Semi-rigid extruded aluminum containers used during the war for blood donor and recipient sets.

available for use with tubes containing caulking compounds for filling in cracks and crevices.

Examples of extruded aluminum containers other than collapsible tubes include pill boxes and vial cases. For containers such as these, the sidewalls are unannealed and considerably heavier. Powder boxes and cream jars are also made of aluminum.

In addition extruded aluminum bottles are available for shipment of essential oils. The latter are made without seams or welds and are produced from thick-bottomed extruded aluminum cans. They range in capacity from $^1/_2$ oz. to 2 quarts.

Where a highly decorative finish is desired for rigid containers such as lipstick holders or compacts, a special process[1] may be employed to give to aluminum any hue of the rainbow. The process involves electrochemical treatment of the surfaces of the metal to build up an adsorbent oxide coating and the subsequent dipping of the container in special dyes. The coating adsorbs the dye and the finish virtually becomes a part of the metal itself. The resultant finish combines hardness and wear resistance with attractiveness of color and lustrous metallic sheen. Etching and stop-off printing may be combined with the Alumilite finish to create variated effects.

[1] The Alumilite Process, patented by Aluminum Co. of America.

3—Pressure test being applied to aluminum beer barrel, which is durable and withstands handling.



A new type of aluminum container with semi-rigid walls has been introduced within the past two years for pharmaceutical and dehydrated food products. It is extremely light in weight which saves shipping costs, and the fact that it is lightproof is important in the packaging of many products.

Drums, barrels, carboys

In the large container field, aluminum has found wide acceptance for drums, barrels and carboys. First use for aluminum barrels was in the brewing industry, and today most of the aluminum barrels in service are used for the transportation of beer. In addition to the fact that they weigh only about one-half as much as conventional wooden barrels, aluminum beer barrels are more sturdy and able to withstand handling. Many aluminum barrels sold to breweries 10 years ago are still in use and in serviceable condition.

Other aluminum containers which received wide publicity during the war were the aluminum drums used by the Air Transport Command for carrying gasoline. The design for the aluminum gasoline drum was worked out jointly by Army engineers and engineers of Aluminum Company of America. The final drum was made of 14-gauge aluminum sheet and weighed only 21 lb.—less than half the weight of a steel drum of similar size. Tens of thousands of these gasoline drums were made and shipped to India in the latter months of the war, where they performed valuable service in carrying fuel over the "hump" to our airmen in China. The saving in weight permitted our planes to carry hundreds of thousands of extra gallons of gasoline.

The lessons learned through the manufacture and use of wartime aluminum containers point the way to a wider field for light alloy containers in many industries. Bulk shipment of food products may be expected in aluminum containers, since the metal has no deteriorating effect upon food, and since any traces of aluminum dissolved are entirely colorless. Most foods are safely handled in aluminum including milk products and dehydrated foods. Aluminum containers are entirely suitable for such products as castor oil, cod liver oil, peanut oil, cotton seed oil and other similar items. Bulk shipment of lard and like products is also possible.

The chemical industry has employed aluminum drums, carboys and other types of container for many years for such products as very concentrated nitric acid, formaldehyde, glacial acetic acid and hydrogen peroxide.

Fibre cans and tubes

by Gene Van Meter

All-fibre cans and the composite cans (fibre body with metal ends) form an important segment of the consumer package industry. Due to both utility and price considerations, these containers fill the gap in the consumer package field that exists between the folding cartons, bag-in-box packages and the all-metal and glass containers.

Certain products which do not require vacuum packing and do not have to be cooked or processed in the containers, do require special features, such as rigidity to accommodate conveyors and filling machines, reclosure features and top fittings such as sifter gadgets and pouring spouts. The folding cartons are not readily adapted to these special requirements. The fibre cans lend themselves to all these features.

As a general rule, fibre cans are more expensive than folding cartons, but cost less than all-metal containers. Therefore, a wide range of products requiring the special features mentioned are efficiently and economically packaged in fibre cans. A few examples of the products that fall in this category are pharmaceuticals, insecticides and food products such as spices and cocoa.

Due to the war-created shortages of all-metal and glass containers, the fibre cans were extensively used as substitutes for other types of container. Naturally, now that other types of container are again available, it is logical to assume that many of the packers who used fibre cans as a wartime expedient will revert to their prewar containers.

However, the fibre can industry gained valuable experience in many new fields during the war. Progress was made in devising special coatings, linings, laminations, fittings, adhesives, etc. It is believed that the industry can now capitalize on its war experience by making better packages for the products which may best be packaged in this particular container.

Fibre cans are fabricated by winding the paper, liner material and label around a mandrel to form the body of the can. Paper ends can be applied either by crimping or by adhesive. When metal ends are used, the metal is seamed to the fibre body of the can in much the same manner in which the ends are applied to all-metal cans.

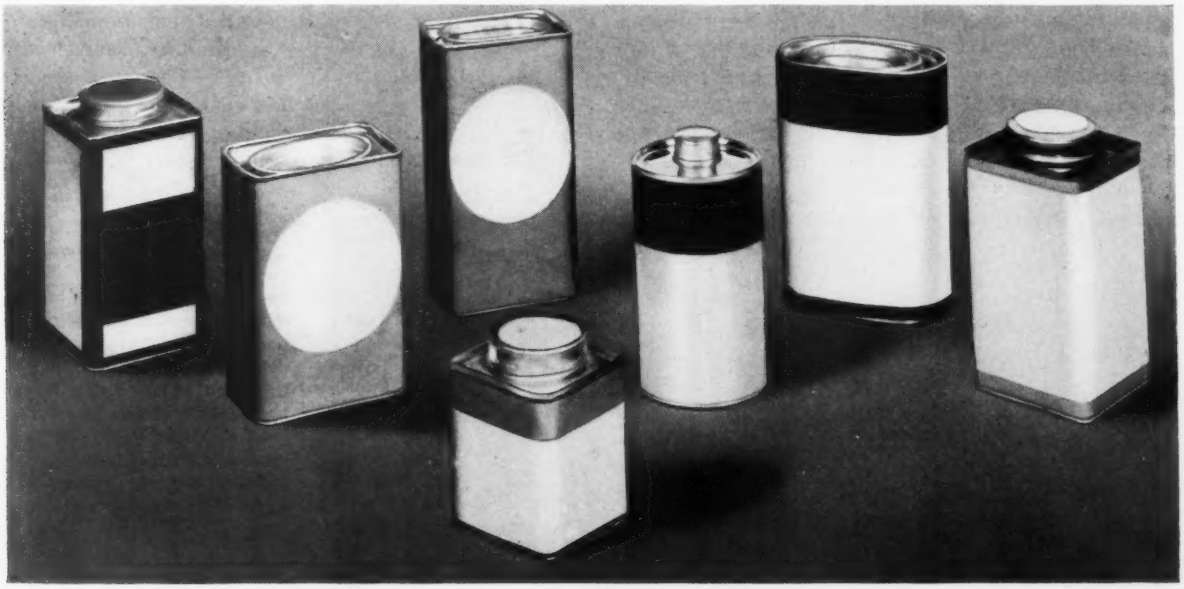
The bodies of the fibre cans are wound either convolutely or spirally on the mandrel. The spiral construction is commonly used for cylindrical-shaped fibre cans as it is a faster and cheaper method of production.

When any shape other than the cylindrical is required, it is necessary to use the convolute style of construction. As a general rule, the fibre can is also more adaptable to special lining and labeling requirements when the convolute construction is used.

Based on these constructions, the bodies of fibre cans fall into two general classifications: they are spiral-wound or convolute-wound. Metal-end fibre cans are generally referred to as "composite cans." All-fibre cans (with paper ends) are known in the industry as "Type A" cans.

1—An interesting assortment of the many sizes and styles which are attainable in composite cans which have light, inexpensive fibre bodies combined with metal tops and bottoms for durability and protection.

PHOTOS 1 AND 2, COURTESY CONTINENTAL CAN CO., INC.



XUM



2—Fibre cans are usually manufactured in long lengths, after which they are labeled and cut to desired size. Then the metal ends are crimped on the bodies. View shows the finished cans as they emerge crimped.

There is no standardization of sizes. There are so many small manufacturers in this field that it has been impossible as yet to settle on any standardization of types, styles or sizes. The industry is much like the set-up box industry in this respect. Each manufacturer strives for individuality and attempts to design and develop special cans for specific end uses.

Fibre cans of today have certain limitations. Inability to withstand extremely rough use and the fact that they do not wholly protect their contents against moisture absorption are the two points on which they suffer most. However, research programs are active and indications for future possibilities are promising.

Perhaps the most promising developments are those taking place in the manufacture of the papers from which fibre cans are fabricated. Pulp companies are constantly looking for ways of strengthening their papers and for ways of making them moistureproof, or at least moisture resistant to a far greater degree than they are now. Manufacturers of machinery for fabricating fibre containers are also engaged in research. In addition, important developments are expected from combinations of paper with other materials—particularly with metals and with protective coatings and linings. As fibre cans improve and become more suitable for products heretofore packed in other containers, we may expect to see their field of application broaden.

Due to wartime paper restrictions, labor shortages and related economic factors, fibre container manufacturers have frequently found it necessary to turn down orders that could easily have been filled under normal conditions In addition, they have had to hold back many new developments—such as packages for quick-frozen foods, plastic-and-metal closures for certain types of composite can and new lining materials—until conditions again make commercial volume production possible.

One thing is certain, however: fibre has won a firmly established place in the packaging field, and under the severe tests of war has demonstrated such qualities as durability and sturdiness, cleanliness, convenience, versatility and flexibility in use. Therefore, there is every reason to believe that containers made wholly or partially out of paper or fibre will become increasingly important in the over-all picture.

PHOTOS 3 AND 4, COURTESY AMERICAN CAN CO.





3—(Left) Frozen foods, all evidence indicates, will be an important field for new packaging developments. A fibre can with metal ends, filled and closed by special machinery, is among the new items. 4—(Right) Lapseam fibre can with metal ends and shaker top is airtight, and treated for greaseproofness.

Paper containers

by L. V. Keefe

The use of round, nested paper containers and straight-side cylindrical cans was accelerated during the wartime years, but there had been a steady growth in the demand for both types during the past decade. Limited production facilities, military and war plant requirements and paper shortages made it impossible for manufacturers of cans and nested containers to meet the full requirements of users who were enjoying a greater market for their own products or suffering the lack of other critical packaging materials under wartime conditions. However, in old and new fields they supplied containers to a greater extent than ever before. In many of those cases where paper was adopted as a substitute for some other material, users learned, under actual production and distribution conditions, that it would do an entirely satisfactory job, offering, in some cases, advantages over previously used packages. New markets thus opened plus the development of new packaging methods in which paper containers of the subject type can meet exacting requirements, indicate a bright future.

The rapid expansion in frozen food production, the construction of new frozen food locker plants and the wide distribution of home freezing cabinets will create new demands. Manufacturers of dairy products, among the largest users of nested containers and paper cans, are planning to package larger percentages of their total output in paper containers. Also, self-service merchandising is generally looked upon as the universal practice in the future. Here paper containers will serve for the packaging of delicatessen items, meat products, ready-cooked foods and other items formerly packaged at the time of sale. Other packaging developments in the food and other fields indicate a much wider use of these two types.

Materials and construction

Only virgin sulfite or sulfite stock is used in the manufacture of nested containers. Depending upon the end use, they may be treated or untreated. The common treating material used is pure paraffin which adds to the strength and beauty of the containers, serves to resist the penetration of water vapor and

1—(Left) Sealed dustproof carry-home bag for container at right. 2—(Right) New frozen food container with special laminated inner surface.

PHOTOS 1, 2, 8 AND 9, COURTESY SEALRIGHT CO., INC.



PHOTO, COURTESY LILY-TULIP CUP CORP.



3—There is great variation in the sizes of nested paper containers which are manufactured for many food products.

XUM



PHOTO, COURTESY AMERICAN CAN CO. AND PUREPAC CORP.



PHOTO, COURTESY SUTHERLAND PAPER CO.

4—(Left) The paper milk "bottle" has proved to be the best for the packaging of frozen milk. In filling, space is left at the top for freezing expansion. 5—(Right) Paper containers are ideal for many dairy products.

some of the other elements which would destroy an untreated package. The fact that nested containers have sidewalls sloping to the bottom allows one container to nest within another, thus providing a very considerable saving in storage and shipping space. Lids for nested containers are either of the coverall type or the snap-in (plug) type. The latter are offered with stitched-on pulls or with an integral tab and fit tightly into a formed groove.

The nested type can be of single-wall or double-wall construction. Single-wall containers are always treated for strength and rigidity and are in greatest demand for the packaging of ice cream and other frozen desserts. Double-wall containers are available both treated and untreated and in two shapes—tall or tumbler, and squat or tub. The untreated tall or tumbler type is most widely used by soda fountains, luncheonettes, restaurants, cafeterias, etc., for hot and cold beverages, soups and similar items which are to be sent out. The squat or tub container, unwaxed, is used for the packaging of ice cream, for perishable precooked foods sold fresh, and for precooked frozen foods which must be packaged at fairly high temperatures.

6—The increasing interest in home freezing of foods has created a new use for paper containers.

PHOTO, COURTESY DIXIE CUP CO.



Waxed nested containers are used for prepackaging a wide line of dairy products such as cottage cheese, sour cream and whipped butter; for frozen foods, particularly frozen fruits packed with sugar or sirup; for seafoods of the shell type; for meat products, fresh or frozen, including sausage, lard, liver, brains, etc.; and for nut meats, candy, honey and honey butter.

Liquid-tight cans with straight sides are usually made of manila stock or of manila stock lined with sulfite or sulfate. For specific purposes, these cans may be manufactured with an additional lining of parchment, glassine, or cellophane to ensure greater protection. They, too, may be treated or untreated with pure paraffin. Tall and squat shapes are provided. Closures for these cans are of the coverall type.

As in the case of nested containers, the greatest market for liquid-tight cans is to be found among users of carry-out containers: dairy product manufacturers, meat packers, frozen food packers, seafood distributors and others offering perishable or semiperishable foods. Cans of this type have also been used for tobacco, vegetable shortening and powders.

Liquid-tight cans and nested containers and covers can be directly imprinted with a packer's trade-mark. They are also offered in plain white or with stock design. A wide range of stock sizes varies from 3 oz. to 5 qt., although sizes up to $^1/_2$ pt. are available only in the nested shape. The $1^1/_2$-, $2^1/_2$- and 5-qt. sizes were developed for wholesale and institutional portions. Other available sizes are offered for the packaging of foods and other products sold at retail.

Finished paper containers are light in weight and are thus more economical to ship, both empty and when filled, than containers fabricated from heavier materials. The raw materials used in the manufacture of paper containers and the high-speed production methods which have been developed during the past several years make containers of this type inexpensive to use. No assembly, either hand or automatic, is necessary at the point of use. These containers can be automatically filled, and the nested type can be automatically dispensed and capped, thereby reducing

costs of packaging. Because of their sturdy construction, production line and transportation wastage and losses are negligible.

Untreated and wax-treated nested containers and liquid-tight cans have not proved to be satisfactory for the packaging of certain products including foods with a high mineral or vegetable oil content and those which must be packaged at high temperature and protected against dehydration during prolonged storage periods. Foods packaged at high temperatures which have a rapid turnover can, however, be packed in the untreated type container. Manufacturers are always ready to guide potential users in the choice of the proper package for a particular purpose.

A modification of this type of container has been developed by several manufacturers to serve the needs of ice cream packers for sizes as large as $2\frac{1}{2}$ and 5 gallons. Strictly speaking, these containers are neither of the nested nor of the liquid-tight type of construction; but their manufacture and functions are similar in some respects, hence they, too, are included in this discussion.

These bulk containers are collapsible and delivered flat to the packer, thus saving considerable storage space—always at a premium in the ice cream plant. The container is intended for one-trip service which has certain advantages from the standpoint of delivery, handling and sanitation. The 5-gal. metal can weighs 12 lb. but the paper can only weighs about 12 ounces. One manufacturer of these cans provides a special portable assembly machine which is leased to users. This assembly machine inserts the top rings and bottoms, making the complete assembly at the rate of four cans per minute in the plant of the ice cream packer.



PHOTO, COURTESY CUPPLES-HESSE CORP.

7—Paper cup for use in factories has utilitarian qualities, plus lithographed safety message.

Many new developments will greatly expand the uses for these containers. As previously pointed out, liquid-tight cans with laminated liners of parchment and cellophane are available, and further improvements will be made. Such linings will serve to overcome some of the limitations mentioned above. It is anticipated that similar linings or plastic coatings will be offered in the nested container group, and plastic materials will probably be applied to liquid-tight cans. These linings or coatings will make paper containers resistant to heat, oils and acids, improve their appearance, and, in some cases, will provide improved protection. New closures will undoubtedly be developed and, very possibly, new physical features will come with improved equipment and methods.

8—(Left) Detailed illustration of the machinery which is used for assembling Bulkan paper container for bulk ice cream. 9—(Right) Bulkan being delivered to retail store. Container holds five gallons.





XUM

Collapsible tubes

by A. W. Paull, Jr.

In spite of the victorious end of the war, war conditions in tube manufacture have not ended. Restrictions against the use of tin and lead have continued and, in the case of lead, have become more drastic than at any time during the war. Early in the war the consumption of tin for collapsible tubes was reduced to one-tenth of the normal amount, but lead was comparatively free until the beginning of 1945.

The Conservation Order for Collapsible Tubes, M-115, was abolished in December, 1945, but all restrictions were continued by the Lead Order, M-38, and the Tin Order, M-43, in 1946. Aluminum, after complete restriction in 1941, was freed in 1944, but due to the difficulties of manufacture and of obtaining equipment for their manufacture, production has only now reached the prewar level of 10 per cent of the total. While this may be increased gradually to 20 per cent in the next year, the allotted supply of lead for this industry has been seriously curtailed by M-38.

Strikes have played their part in the curtailment, and so has the OPA by continuing the low price of $6^1/_2$ cents per pound for lead which was established in 1942. Other countries have abolished price control of lead and it has risen to $8^1/_2$ cents and 9 cents, with the result that countries which formerly exported to the United States are naturally sending lead to the free and higher markets found elsewhere. There has also been a tendency to hold back domestic production in the natural expectancy of higher prices later on.

Of course, the OPA claims that domestic production is enjoying world prices by the operation of the Premium Payment Plan through Government subsidies.

1—At the end of enameling machine, collapsible tubes are inspected as they emerge from the dryer.

PHOTO, COURTESY WHEELING STAMPING CO.



A bill is before Congress to raise the price of lead to 8.15 cents per pound. If passed, it would probably have a beneficial effect in encouraging increased domestic production of lead as well as in stimulating the purchase of lead from outside sources. In the meantime, the production of collapsible tubes suffers and lags behind high peacetime requirements.

Metal collapsible tubes seem to have made their mark in war usage because they are light in weight, sanitary, fold up out of the way as used and will not shatter or cut the user. They are among the best traveling companions. Their superiority has overcome any resistance there may have been to the use of lead containers. With wax lining and attractive decoration, colorful cap and carton, it is difficult to keep up with demand.

Many tubes using plastics, paper or other basic materials have been invented, but we know of none which can compete with the demonstrated qualities and economic advantages of metal tubes. Exhaustive tests with the actual products to be packaged, particularly when essential oils are in the formula, must be made by the product manufacturer. The shelf life of metal collapsible tubes in normal times averages about 15 months. Some collapsible tubes were found to have remained in stores eight years without any damage whatsoever to the tube or to its contents. This is an experience gained by the operation of the "tube-for-tube exchange" carried on during the war. Incidentally, this operation recovered two million pounds of tin and three million pounds of lead which were returned to high-priority war usage. The operation also was carried on at a large profit to the Government.

Under normal conditions, collapsible tubes may be classified in five types, depending upon the material.

Pure tin tubes—Made of new virgin tin, alloyed with a small amount of copper or other suitable stiffener, in minute quantities. No adulterant, such as lead or other soft metal, is used in these tubes, and they are essentially for use for any product going on or in the human body. Included among these products are toothpastes, shaving creams, cosmetic creams, depilatories, hand soaps and pharmaceuticals.

Lead tubes (lead-alloy tubes)—Made of lead alloyed with antimony or tin. They have been used almost entirely for nonpersonal products such as adhesives, shoe polish, paints, colors and greases.

Aluminum tubes—Made of pure aluminum, formerly replaced tin tubes to the extent of about 10 per cent of the total consumption. Because of the great chemical activity of aluminum, use of it was restricted to chemically neutral products until suitable vinyl compound coatings were developed.

Tin-coated lead tubes—Lead-tube structures coated

with thin layers of tin, inside or outside or both, which present much the same appearance as tin and are less expensive. However, they have not been generally accepted as fulfilling the standards of quality set by manufacturers or by the public. In some cases, the combination of the two metals in the presence of an electrolyte—an alkaline product, for example—has resulted in electrolytic action detrimental to both product and container. Internal coatings have been perfected which have largely overcome this objection.

Tin-lead alloy tubes—A recent development for which some advantages over tin-coated lead are claimed. The principal difference is the avoidance of electrolysis. Tubes of this type may be internally coated, as in the case of aluminum, and tin-coated with equally good results.

There is no great trick in drawing tube specifications. The dimensions are determined by the amount of product it is desired to pack or by the size of tubes used in similar price lines by established competing products. The size of the neck opening is, in large measure, determined by the plasticity of the product and the quantity ordinarily used in one application. Thus "brushless" shaving creams are packed in tubes with large openings, ophthalmic ointments in tubes with pinhole tips.

Specifications for tubes require the following data:

Dimensions—Diameter at the shoulder; length from shoulder to open end; size of neck or diameter of neck opening; wall thickness at shoulder

Cap—Material and type of cap; type of liner

Decoration—Shoulder embossing, if any; coating and number of colors in printed matter

Metal—Tin, tin-coated lead, lead or aluminum

The cylindrical shape of collapsible tubes is dictated by the method of manufacture and the method of closing and sealing. Possibilities of variation in structural design are, therefore, nil. Design enters into the appearance of the cap and the embossed decoration on the shoulder, but it is on the "label" or side that design has fullest opportunity. While the fixed cylindrical shape imposes certain limits, these are the only limitations. Label designs may be of any character capable of reproduction by zinc etching, photogravure or half tone. Decoration may be printed or embossed and printed in from one to four colors on a white or tinted coating. By the use of process plates, additional tints can be secured if they are desired.



PHOTO, COURTESY ALUMINUM CO. OF AMERICA

2—Metal screw caps, plastic tops, dispensing devices and applicator tops on collapsible tubes.



3—Single dose collapsible tubes provide a convenient-to-carry package with merchandising appeal.

PHOTOS 3 AND 4, COURTESY SUN TUBE CORP.



4—Convenient for consumer use in exact matching of paint shades are these small collapsible tubes.

XUM

Coatings for collapsible tubes

by Robert J. Gray

Choice of coating material for the collapsible tube is a factor of great concern to manufacturers whose products are packaged in these containers. The versatile tube has such a range of uses that today, in the terms of the chemist, it must withstand products with a range of 3.5–11 pH. This means, in nontechnical terms, resistance all the way from a good sour, acid vinegar right through to harsh products such as washing powder.

With such a wide range of acidity and alkalinity for products packaged in tubes, there is a tendency on the part of some to perforate or pit the metal of which the tubes are made, causing a growing demand for protective coatings. Recently lead has been used to replace tin as the common tube-making material, and protective coatings have assumed an important role, not only to prevent pitting, but also to prevent contamination by lead salts.

During the past few years, researchers have been investigating this question of lead pick-up. Dr. David Menard's findings[1] indicate a significantly lower absorption of lead from wax-coated tubes. At the same time, the members of the Packaging Institute have carried out a great deal of work which has led to the same conclusions.

However, there is still much work to be done because of the many factors which appear to affect the situation. For example, there are indications that underfill in tubes seems to influence lead pick-up considerably, showing a 300–600 per cent increase in pick-up over the filled tubes.

Types of protective coating material

There are two main types of coating material—thermoplastic coatings and lacquers. Each has its field, although the thermoplastic coating appears to offer greater resistance to contamination over a much broader range of products. Lacquers, in general, are difficult to apply and to dry. They require special equipment for application, as well as for the evaporation of the solvents used. They have a tendency to develop pinholes, due to their variable nature, and their anchorage to the tube body is not too satisfactory. In addition, lacquers frequently have poorer resistance at the higher pH values.

Wax types of thermoplastic are more widely used than lacquers, and they are far easier to apply. Good equipment, in general use among the trade, is available. The performance of wax types of coating naturally depends upon the material used, since a marked difference exists between the films formed by ordinary waxes, by blends of waxes and by the new thermoplastic coatings. This difference in effectiveness must be remembered when wax coatings for collapsible tubes are being considered.

Ordinarily, simple waxes or blends of waxes may fail to give complete protection to the tube, for reasons of lack of continuity of the film, tendency toward development of pinholes and possible crystal formation. From an operating point of view, the viscosity of waxes or blends of waxes is ordinarily so low at application temperature that it is difficult to produce a film of sufficient thickness, flexibility, adhesion, and with enough continuity to give good protection to the tube which is to be coated.

Thermoplastic coating materials, on the other hand, are characterized by cohesiveness and continuity of film. They are solutions of selected blends of waxes with high-polymeric, nonwaxy materials of complex molecular structure which inhibit crystal growth and favor continuity and impermeability of the film. These thermoplastic coatings produce good adhesion to the metal tube and are flexible. They are also characterized by a hard surface which resists the abrasion of the filling operation. From an operating point of view, they are homogeneous products which do not separate or throw out in the melt tank, and their controlled viscosity over a wide temperature range gives coatings of uniform thickness. Thermoplastic coatings are doing much to reduce the variability in performance of collapsible tubes.

Application of coatings

Thermoplastic coatings are applied by flushing the inside of the tube as a final operation of manufacture. The tubes, either singly or in pairs, are placed over a vertical mandrel having an actuating pin in the top. After being flushed by pressing the tubes down on the pins, a conveyor belt then carries them through a heated oven at 200 deg. F. (or a temperature sufficiently above melting point of the coating material so that the excess drains off), leaving a thin, uniform film. The drainage time is approximately 45 seconds. After drainage the wax tubes are inverted and, finally, they are packed into containers.

Thickness of coating

Opinion as to thickness of coating desirable varies quite widely. It is certainly true that the thicker the coating, the less the diffusion of lead, all other things being equal. There are other factors to be considered, however—for example, the tendency of heavier coats to crack, which interferes with the sealing and crimping operation.

[1] Published in the *Journal of the American Pharmaceutical Association*, Scientific Edition, XXXII, No. 8 (August, 1943).

ADVERTISING FOR CANS & TUBES



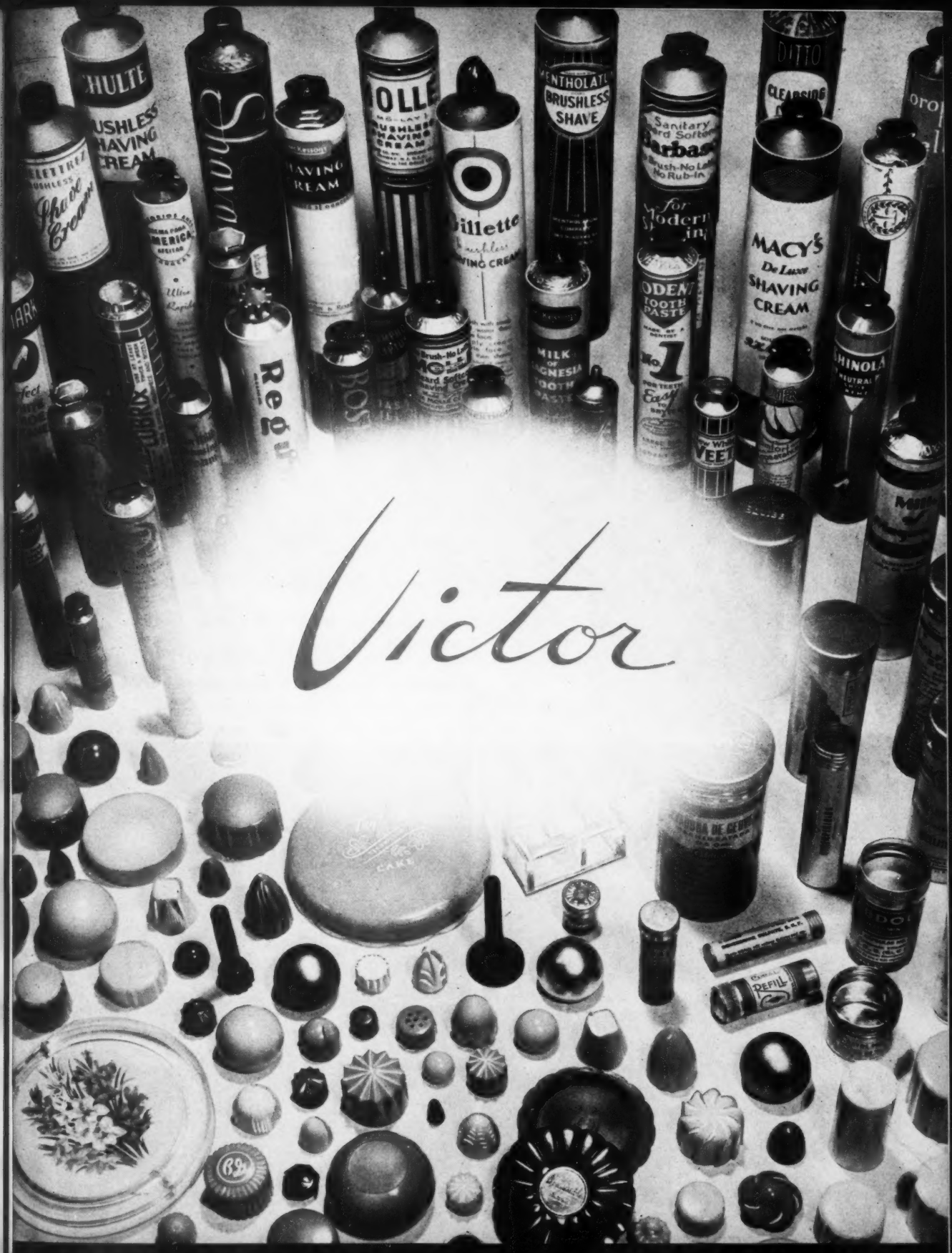
Cangenuity, Crown's ability to combine ingenuity with canmaking skill, is represented by such exclusive developments as Crowntainer, the seamless steel bottle, and the "breather" can especially designed for volatile chemicals. In sanitary cans you get the advantages of Crown's "cangenuity", for this expertness in special complex jobs assures a standard of excellence in simpler ones.

CROWN

FINE METAL CONTAINERS

CROWN CAN COMPANY • PHILADELPHIA

Division Crown Cork & Seal Company, Inc. • Baltimore, Md.



VICTOR METAL PRODUCTS CORP. • 196 DIAMOND STREET • BROOKLYN 22, N. Y.
ALUMINUM, TIN AND LEAD COLLAPSIBLE TUBES • ALUMINUM VIALS • PLASTICS

XUM

ROUND PACKAGES ARE BETTER PACKAGES —AND CLEVELAND MAKES ALL TYPES!



1



2

The Cleveland Container Company offers the most complete line in the round paper package field.

Manufactured on our own specially developed equipment, these packages are produced at low cost, sold at low prices.

Our numerous plants, strategically located to serve the industry, reduces shipping costs to a minimum.

(1) Plastics for closures, toy wheels, coasters, checkers, etc. Our own special material.

(2) Fiber drums for dry products and semi-solids.

(3) All paper container—drawn ends—for foods, drugs, chemicals and shipping.

(4) Metal end containers for drugs, chemicals and foods.

3



4





5

(5) Curled end containers for novelties, cosmetics, drugs and specialties, drug specialties and dentifrices.

(We have developed special automatic equipment for discing, crimping, curling, to manufacture these expensive looking containers almost at the same cost as the simple paper cap type. Color possibilities are infinite as well as designs, decorations, etc. Investigate now!)

We offer the services of packaging specialists, engineers and designers—who know all the possibilities of round paper packaging to help solve your problem.

The CLEVELAND CONTAINER Company

10630 BEREA ROAD—CLEVELAND, OHIO

Other Plants:

NEW YORK CITY
DETROIT — WEST NEW YORK, N. J.
CHICAGO — MILLTOWN, N. J.
PLYMOUTH, WISC. — PHILADELPHIA
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PLYMOUTH ENGINEERING
PLYMOUTH PLASTICS
ABRASIVE DIVISION (NO-LAP)
WILLARD PASTE & GLUE CO.
CLEVELAND CONTAINER CANADA, LTD.

XUM



An *Open* Secret about What's Inside

See-Thru CONTAINERS *"Show What You Sell"*

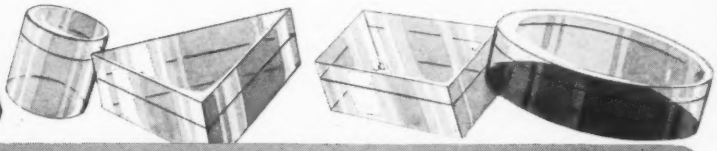
America is plastic conscious . . . from suburb to city, sparkling acetate containers are the choice of alert manufacturers and retailers. Crystal-clear acetate rates an undisputed "first" as packaging material from point of display and increased saleability of merchandise.

These containers can be produced in a wide variety of shapes and sizes, sturdy materials, and fast finishes with a choice of metal covers, metal or cardboard bottoms, or all acetate.

Custom-made acetate packages will be manufactured to your specifications, or you may use our staff of designers to put your ideas into package form.

While the blank containers add lustre and glamor to the contents, your own trade mark, logotype, or colorful, decorative design printed on the package will enhance its beauty.

Permanent colors and inks guaranteed against chipping, are used in printing. These containers offer the consumer many opportunities for re-use . . . so much so, that in many instances it is the container, itself, that swings the sale.



CANDY · COSMETICS · FLOWERS · FOODS · FRUIT · GLOVES · HOSIERY · JEWELRY
MEN'S WEAR · MILLINERY · PENS AND PENCILS · PERFUMES · PHARMACEUTICALS · SMOKING ACCESSORIES

Don't Forget . . . Metal Containers Are Back Again

There are many packaging problems best solved by the use of all-metal containers. In line with that thought, we want to remind our many clients that original package designs are ready for presentation. These are highly recommended for seasonal or holiday packaging. Stock designs are also available. And, as in the case of acetate containers, all-metal containers can be produced to your specifications, or you may use our designers.



Consult us on your packaging problem . . . no obligation for a consultation.

GEORGE V. CLARK CO., INC. • 26-15 FOURTH STREET ASTORIA, NEW YORK

Pack Safely IN ALCOA ALUMINUM TUBES



Alcoa Aluminum Tubes are "good to the last squeeze". Strong . . . they don't spring leaks and get messy. Soft . . . being thoroughly annealed they are pliable for easy squeezing. Light . . . they cut down shipping costs. Attractive . . . they are expertly lithographed in crisp, clear colors. Non-toxic . . . they are safe to use for all products.

If there is any question of chemical reaction of any kind between aluminum and your product, the Alcoa Packaging Laboratory will conduct tests to determine what type of interior protective coating will be needed to assure a corrosion resistant, satisfactory package.

Since 1921, when Alcoa produced the first aluminum collapsible tubes made in America, Alcoa has studied the packaging of preparations of all kinds. This long experience is assurance that you will find the correct answer for your needs when you buy Alcoa Aluminum Tubes.

Made in standard diameters ranging from $\frac{5}{8}$" to $2\frac{1}{2}$" and in lengths from $4\frac{1}{2}$" to 11". Write for samples and prices.

ALUMINUM COMPANY OF AMERICA, 2150 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in principal cities.

ALCOA FIRST IN **ALUMINUM** REG. T. M.

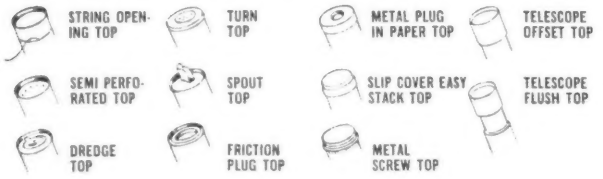
Sefton IS TOOLED FOR THE JOB!

SIZES

There's a size for every need and product, from wee containers to huge fibre cans!



TYPES



SHAPES

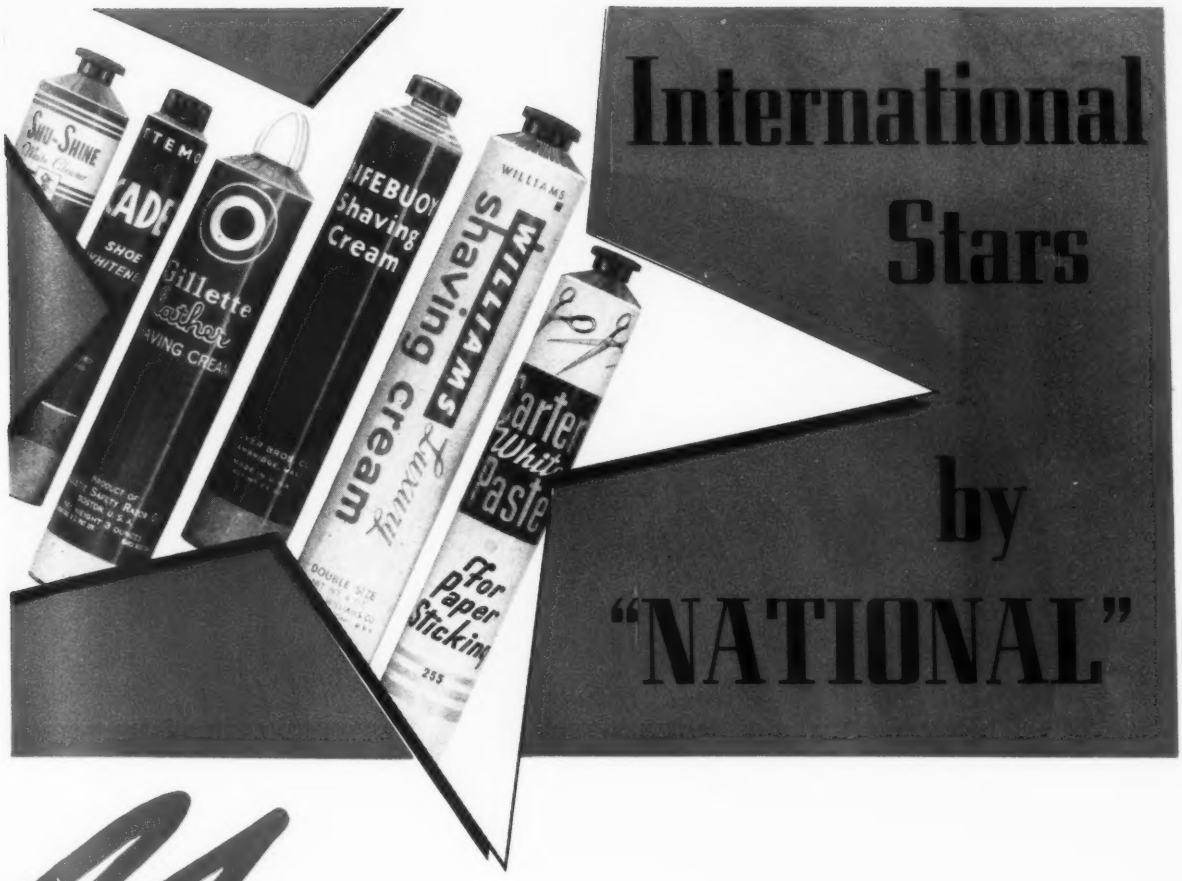
A shape to fit your product, including round, square, oblong, triangular, obround and oval.

No matter what your packaging problem ...no matter what your job...Sefton Fibre Can Company is equipped and ready to do it for you! If it's a tiny can you want...or a mammoth one...in any conceivable shape, Sefton will make it for you! They'll add just the type top you need, too, to suit the needs of your product. See Sefton to solve your packaging problems!

Sefton FIBRE CAN COMPANY

ST. LOUIS . . . . . NEW ORLEANS

DISTRICT OFFICES: • Los Angeles • San Francisco • Denver • Tampa • Chicago • Des Moines • New Orleans • Boston • Detroit • Kansas City • St. Paul Omaha • New York • Cincinnati • Cleveland • Oklahoma City • Pittsburgh • Memphis • Nashville • Dallas • Houston • Salt Lake City • Seattle



International Stars by "NATIONAL"

You may not be interested in our problems—but we're interested in yours! That's why our users have found "National" tubes free from pinholes, splitting, peeling of enamel and other war-born defects.

This is a QUALITY plant, able to handle a large volume on a dependable delivery schedule, but always on a basis of carefully controlled quality in which the owner-managers take personal pride and interest.

National

COLLAPSIBLE TUBE CO.

410 Carpenter St., Providence, R. I.—Offices: Chicago, San Francisco

Art Tubes . . . .



● COLLAPSIBLE METAL TUBES

Made right from start to finish in our own plant—from the actual pig of metal to the completely decorated tube—under the capable management and supervision of craftsmen whose experience and knowledge extends through two generations.

● HOUSEHOLD CAN SPOUTS ● SPRINKLER TOPS ● CYLINDERS

● PIONEERS IN THE FABRICATION OF TINLINED TUBES

ART TUBE COMPANY

500 Lyons Ave.
Irvington, 11, New Jersey
TELEPHONE WA. 3-6400

TIN • TINLINED • LEAD • ALUMINUM • WAXLINED

ART TUBES MAKE A GOOD PRODUCT LOOK BETTER!

Specialists in Small and Medium sized Metal Cans

(8 OZ. AND UNDER)

SHOE POLISH AND OTHER WAX POLISHES, SADDLE SOAP, OINTMENTS, PILLS, DENTAL AND SURGICAL PREPARATIONS AND SIMILAR PRODUCTS



Even the largest users of large sized tin cans come to BURDICK for their small and medium sized lithographed metal containers. The reason: We are specialists in these packages. Our entire personnel and plant, including all of our equipment, are geared to the quick economical manufacture of small and medium sized cans. Our entire experience, our designing knowledge, our production know-how, all revolve around the solving of this specialized problem.

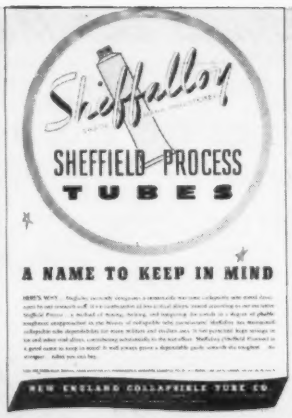
We can handle with equal facility both large orders and small orders. Because we are specialists, we are able to design and produce your smaller tin containers better, quicker, more economically.

BURDICK & SON INCORPORATED

ALBANY NEW YORK

























The reproductions of a recent ad series, illustrated here, show a number of tangible reasons for specifying *"Sheffalloy" Sheffield Process Tubes* and VINICOTE inner coatings. Among the *im*angibles is the fact that the first toothpaste ever packed in collapsible containers used a *Sheffield Process Tube!* The 96 years of experience we have acquired since then assure you of unparallelled "know-how" in collapsible tube manufacture. If your product can be packed in collapsible tubes, specify tougher *SHEFFALLOY.* Call or write our nearest office for every possible cooperation.

NEW ENGLAND COLLAPSIBLE TUBE CO.

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The patented R. C. Can method of attaching the heads to the core of the spool makes the spool roll truer when winding or unwinding from a dispenser.

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...ore cores you need, see your ...company representative.

R.C. CAN COMPANY

Manufacturers of fibre cans, tubes, spools and cores
Head Office: St. Louis, Mo.
Branch Factories: Arlington, Texas; Rittman, Ohio; and Kansas City, Mo.
Sales Offices: Minneapolis, New Orleans, Atlanta, Memphis, Milwaukee, Louisville, New York, Pittsburgh, Denver and Los Angeles.

R.C. CAN CO. THE STAMP OF QUALITY ST. LOUIS, MO.



Spiral Wound PAPER TUBES AND CONTAINERS

DIAMOND TUBES and Containers—the Post War, efficient and economical answer to so many production problems.

DIAMOND TUBES have the PRECISION to satisfy most exacting requirements; PLUS the experience and capacity to interpret your needs speedily and in quantity.

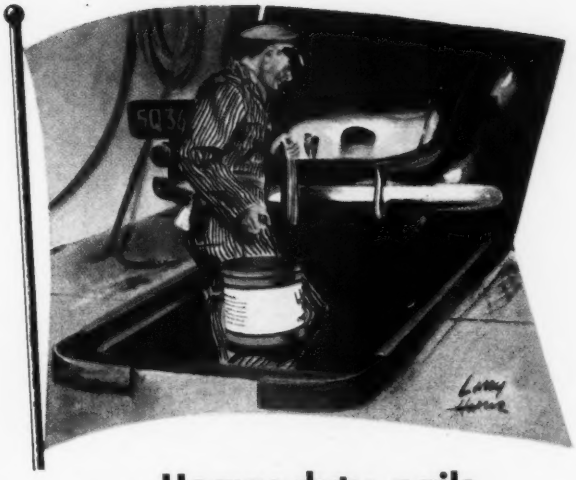
DIAMOND TUBES now serve the Electrical, Radio, Toy, Cosmetic, Medical fields and many many others. It's entirely possible that a use can be discovered in your product.

DIAMOND TUBES can cut costs and time. Our Engineering Staff is always pleased with a new problem. Why not allow us to make a suggestion for your business?

DIAMOND STRAW & MACHINE COMPANY

32–36 WEST 18th STREET **NEW YORK 11, N. Y.**





Plastics for swanky clocks.....Heavy-duty pails





Cans with labels lithographed.....To increase product sales

ALL ARE MADE BY CONTINENTAL CAN COMPANY

We're a big family—here at Continental—with many different interests in life. Many of us concern ourselves mainly with cans. But others spend their time on steel pails. Paper cups and containers are a big field for us. And fibre drums are not to be ignored. Kitchenware's an important sideline. Crowns and caps, another. And—yes—we make plastics, too. But here's the point:

We all have one thing in common—the name "Continental Can Company." We're mighty proud of this name and all it stands for. You'll be seeing our name and the famous Triple-C trade mark more and more in home and industry. When you do, remember—the Triple-C means quality.

Tune in "CONTINENTAL CELEBRITY CLUB," every Saturday over CBS coast-to-coast network



Products and Divisions of Continental Can Co.
100 East 42nd St., New York 17, N. Y.

CONTINENTAL PRODUCTS: Metal Containers · Fibre Drums · Paper Containers · Paper Cups · Plastic Products · Crown Caps and Cork Products · Machinery and Equipment.

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FOREIGN SUBSIDIARIES: Continental Can Company of Canada, Limited, Sun Life Building, Montreal, Canada • Continental Can Corporation, Havana, Cuba.

Continental serves behind the scenes

...behind the labels of America's finest products

XUM

Sal Hepatica takes a prescription!



SAL HEPATICA had a slight case of package-trouble.

The package: a small glass vial which held a "physician's sample" of the product.

The trouble: this glass vial had a bad habit of cracking up in packing or shipment.

So we had a look at the trouble ... and promptly prescribed our Unitainer, the convenient, compact, one-dose collapsible tube. And Sal Hepatica *took* the prescription.

Good medicine? Must have been, because every symptom of package-trouble disappeared. No more samples crushed or broken in transit. Instead, every sample reached some doctor's office in perfect condition. Because neither air nor moisture nor germs can get inside a Unitainer, not until the very moment of use.

But your product is different?

Of course it is. Yet perhaps your packaging problem isn't so "different" as you might think. Almost any packaging problem gets a lot closer to solution when it gets this kind of design ingenuity and resourcefulness.

You already know that the collapsible tube has unique, inherent advantages: it's virtually unbreakable, compact, germ-proof, light-proof. Contents won't dry out in use.

But this may be news to you: recent developments have made Sun Tubes ideal containers for products never before thought suitable for tube packaging!

Can these developments help solve your packaging problem? Just ask the Sun Tube representative nearest you. A phone call or postcard will bring him to your office.

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BEAUTY
FOR YOUR PACKAGE
J&L
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Beauty is more than skin deep when you use J & L Electrolytic or Hot-Dipped Tin Plate for your decorated boxes and containers. It is a quality tin plate all the way through — made especially to provide the perfect background for your painted or lithographed designs.
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5
BILLION DOLLAR PACKAGING MARKET

—*Paced* BY ONE ABC MEDIUM

The medium? . . . Modern Packaging Magazine!

This aggressive authority possesses a "boarding house" reach . . . stretches out to and into all of the forty-four industries that comprise packaging's vast market.

Modern Packaging's steadily increasing circulation—now 10,900 strong—is strictly 100% ABC! . . . 100% Paid!

Modern Packaging's years as the packaging market's leader and pace maker accord it center-of-desk reading preference with its subscribers—the big men in all of the big companies.

Merchandising-wise, this fact is weighted with importance for within the scope of Modern Packaging's straight reach are the plums of the packaging market's $5,000,000,000.00 annual purchase commitments.

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122 EAST 42nd STREET, NEW YORK 17, N. Y.
CLEVELAND • CHICAGO • LOS ANGELES

WIRZ COLLAPSIBLE TUBES
FOR YOUR CREAMS, PASTES, POWDERS, LIQUIDS

INCREASE EYE-APPEAL, PROTECT YOUR PRODUCT, ADD CONVENIENCE

Whether your product is a newcomer or a well-established one, you can increase its eye-appeal and its convenience and at the same time keep it free from contamination in attractive, sanitary, self-dispensing WIRZ Collapsible Tubes. Designed with walls of uniform thickness, correct structure and orifice, WIRZ Tubes take decorative inks and lacquers beautifully. Self-dispensing, convenient, they prevent waste, protect your product and your customer good-will. Let us help you plan now for this extra appeal, protection and convenience.

A. H. WIRZ, INC.

Established 1836

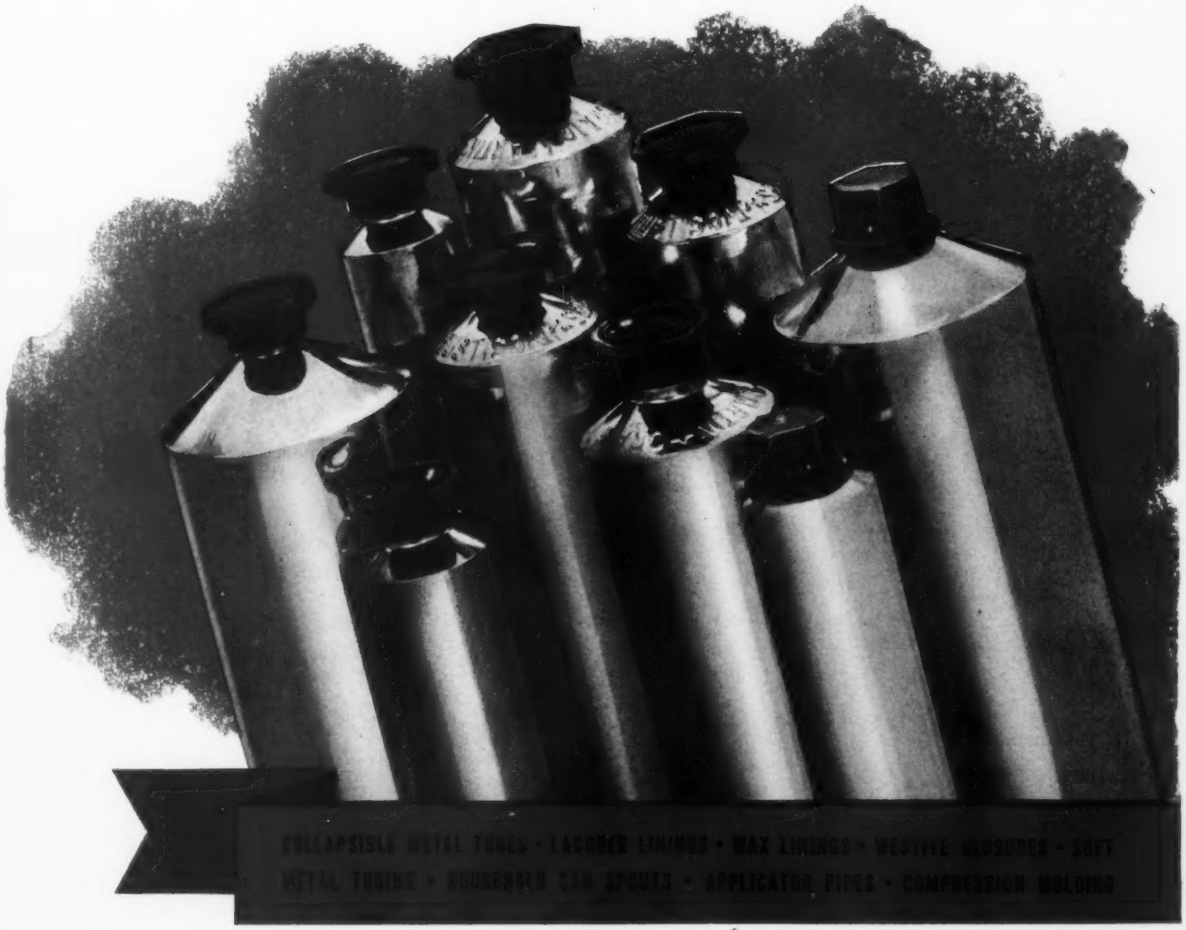
CHESTER, PA.

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New York 17, N. Y. 50 E. 42nd St. | Chicago 4, Ill. 80 E. Jackson Blvd. | Memphis 2, Tenn. Wurzburg Bros. | Havana, Cuba Roberto Ortiz Planos | A. G. Spilker { Los Angeles 14, Calif., 1709 W. 8th St. Exposition 0178—Also Danville, Calif.



COLLAPSIBLE METAL TUBES • LACQUER LININGS • WAX LININGS • WESTVIC CLOSURES • SOFT METAL TUBING • SQUEEZABLE CAN SPOUTS • APPLICATOR PIPES • COMPRESSION MOLDING





PAPER FOOD CONTAINERS ARE A SPECIALTY . . .

and Sealright has *specialized* in them for almost 30 years!

Sealright's leadership position in the paper container field rests upon this solid base—

We devote our skill, resources, research and manufacturing facilities to just one thing—making sanitary paper containers and closures and the paper board that goes into them.

With Sealright's *specialized* experience behind you, you are in a preferred position to take advantage of profitable opportunities for *increased* paper container sales under post war conditions.

A Big New Market In Frozen Food Field

Sealright is ready for it with a line of improved sanitary frozen food containers for all types of frozen foods. Department and hardware stores, food stores and locker plants are ready to buy these new Sealright containers in substantial quantities. Write for complete information.



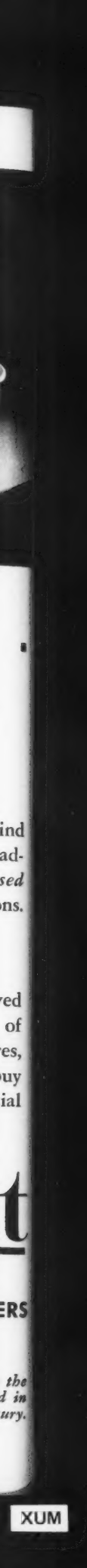
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GLASS—CLOSURES—POTTERY



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The importance of glass in packaging

by F. P. Gass

Of the primary retail packaging materials, glass is by far the oldest. Bottle blowing, following a handicraft tradition of many centuries, was one of the earliest American industries, and small shops have sprung up since the first colonial days wherever sand and fuel were found together. The abundance in this country of the raw materials for glass is, of course, one of the reasons for its flourishing growth. But the long history of glass blowing is chiefly interesting as an evidence of its economic vitality; it does not explain why glass is one of the leading packaging materials today. Among its principal advantages appealing to the packer are:

Inertness to reaction—The first function of a packaging material is to protect the products it packages. Glass fulfills this function by the fact that it does not transfer tastes, odors, dissolved substances or the products of corrosion into the commodity. The protective function is completed by the various methods of sealing, and by liners and coatings developed for the closure.

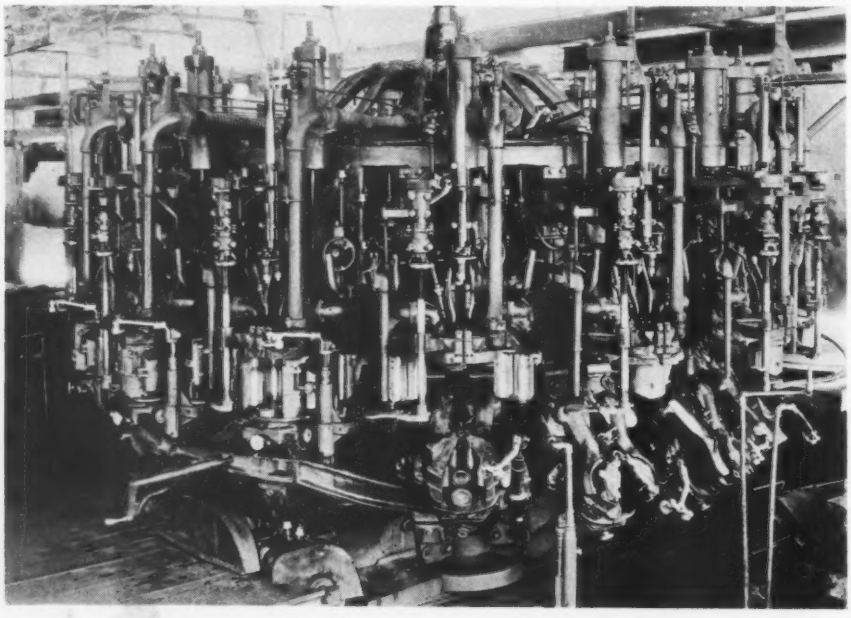
Moldability—While many types of container are limited as to shape or design, the glass container may be made in a wide variety of shapes and designs and in capacities ranging from a fraction of an ounce up to the 13-gal. size for carboys. Restrictions on design are chiefly those of cost. Because of this quality of moldability, families of glass container designs have developed which are so peculiarly adapted to the requirements of various products as to be practically identified with them in the consumer's mind.

Packers have made use of this characteristic of glass by seeking to associate a private mold in the public mind with their own brand name. Furthermore, variations in glass container design are possible in order to meet the peculiarities of a packing process or merchandising situation, or to adapt a bottle or jar to a specific consumer use. The temptation to exploit this quality of glass has sometimes led to impractical extremes or to a defeat of the advantages of quantity production. The corrective in recent years has been the growing use, even before the war, of standard designs which individual packers may make distinctive by ingenious treatment of label and closure.

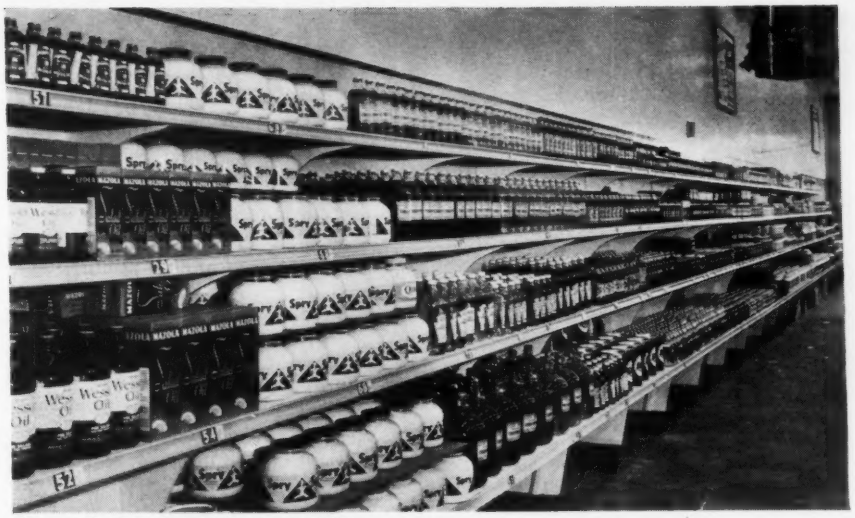
Comparative cost—For many products, glass is the traditional container. In these cases, the matter of competitive packaging costs does not involve other types of container. Here the competition is with other packers in glass, but even so, it is forcing numerous cost-reducing improvements in handling methods.

On the other hand, the glass container is successfully competing, in a growing number of cases, with other types of package. The original cost of the glass plus the average closure is comparatively low, particularly when it is remembered that such cost almost always includes the re-shipping container. It is in the packaging, as distinguished from the container costs, that glass has hitherto been at some disadvantage. These have arisen from such factors as slower handling and processing, higher shipping weights and the like. But the war proved that, on a line expressly designed to handle glass, the difference in costs in respect to other types of container may be drastically lowered, and in some cases reduced to a point below other packaging costs. Break-

PHOTOS 1 AND 4, COURTESY OWENS-ILLINOIS GLASS CO.



1—The mass production of commercial glass containers has demanded the development of intricate and efficient machinery.



2—The asset of visibility in glass packaging is illustrated. Glass containers help to sell their contents, and make a striking shelf display as well.

PHOTO, COURTESY OWENS-ILLINOIS GLASS CO., FILM DIVISION

age on a well-operated line amounts to no more than spoilage of other containers, and even the difference in shipping costs has been reduced by lighter weight glass designs and cartoning.

As a result, the retail selling price of many glass-packed products has been brought down to competitive level, at most with a one or two cent per unit differential for average retail capacities, as compared with the same product in another container.

The practical eventual limitation on lower retail prices for some glass-packed products may be material costs rather than packaging costs. The glass container, being transparent, is particularly suited to the premium grades of a product which command a higher price.

Transparency—The advantage of transparency has made the glass container a natural sales package, the container itself forming a display for the product.

Convenience—In addition to performing its packaging functions, the glass container is also suitable as a service container. Glass bottles and jars for foods, for instance, have enough social acceptance to appear at the table. More important, the glass container is also a safe and convenient storage container. For the dozens of products, from liquors to foods and chemicals, which even in retail quantities are not entirely consumed immediately upon opening the package, this characteristic of glass is an important factor.

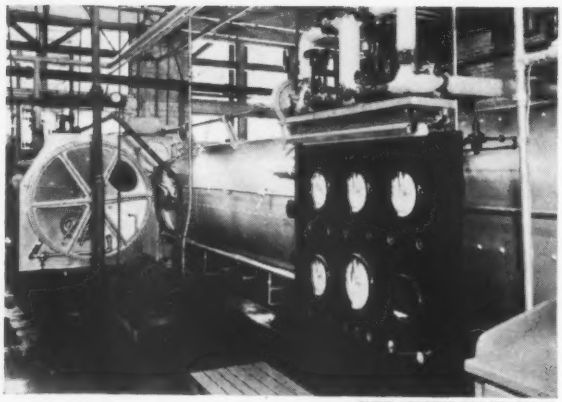
Distinctiveness—With his glass container, the packer has an unusual opportunity to obtain a distinctive package—one which will be easily and quickly linked with his name or brand. Even aside from container design, he has considerable latitude in his treatment of detail. He is not limited to a single shape for his label, for instance. The type and color of the closure are important elements in the appearance of the completed package and deserve careful consideration. Sometimes a neck wrapper or other decorative feature may be added. Ordinarily there is even some choice in the color of glass, which may be available in amber, emerald or blue as well as flint. The process of fusing color designs or lettering into the glass offers still another possibility of varying package appearance.

Such characteristics as these account for the widespread usage of glass containers, a usage for which the annual production figures give an entirely inadequate picture. Glass containers in general are divided into two categories—returnable and nonreturnable. Milk bottles, beverage bottles, home-canning jars and about 60 per cent of the annual production of beer bottles belong in the returnable category. As a result of the multiple trips made by this latter class, the number of fillings of glass containers is many times the number produced. For example in 1940, when domestic shipments totaled 52,494,000 gross or approximately 7,560,000,000 units, it is estimated on the basis of closure usage, surveys and other data that close to 55,000,000,000 glass containers were actually filled.

The war years brought a tremendous expansion of glass container production and use. Shipments in 1945 very nearly doubled the 1940 figure, and the industry believes that if fuel, material and labor are available, an output in the neighborhood of 110,000,000 gross should be attained in 1946.

After the predictions made a year ago for the postwar course of American industry, which should serve as a warning to the chart-reading species of prophet, it would be unwise to venture further forecasts. But some of the errors of those predictions relating to the glass container business may well be pointed out so that they can be avoided in the future. In the first place, it was known that the glass required directly by the military forces was limited to approximately 15 per cent of production, and the removal of this demand was easily replaced by the needs of packers who had been restricted or denied during the war. In the second place, much of the total increase in the use of glass came from products which have traditionally been in glass, and the eventual level of their volume will, to a large degree, depend on general purchasing power. In the third place, the extent to which glass was used

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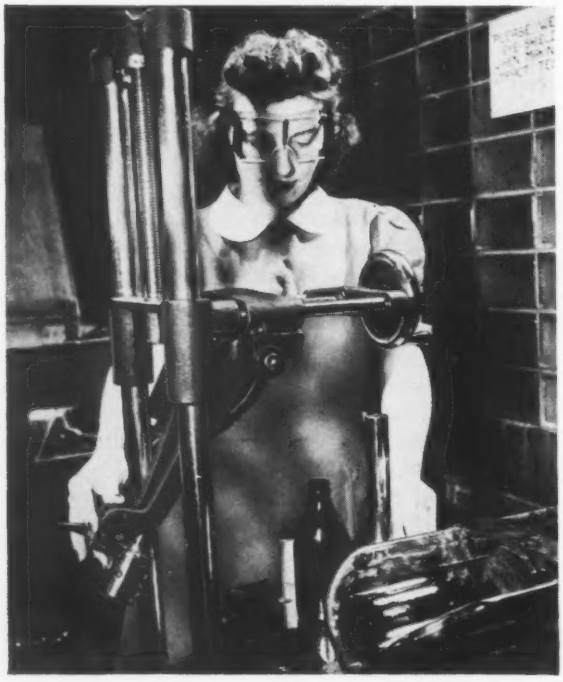


PHOTO, COURTESY THE FOXBORO CO.

3—In continuous retort glass packing, both temperature and pressure are automatically controlled.

purely as a wartime substitute for other container materials was somewhat exaggerated. Large increases occurred in lines where glass was not a substitute but an alternate container which had already met with a greater or lesser degree of success before Pearl Harbor. These include fruits, vegetables, coffee, sirups and household products and it is reasonable to believe that the war accelerated, but did not create, the market for them. It is likewise reasonable to believe that a considerable volume of such products will remain in glass when the full competition of other packaging materials returns. In the fourth place, the current volume of glass containers has been channeled by the restrictive orders into larger average capacities than would normally be used. Such a measure had to be taken in order that there would be enough glass to go around. As the pressure of demand goes down, it may be expected that lower average capacities will be permitted. More containers will be used for the same volumes packed; this tendency will compensate to an unknown degree for a falling volume.

4—Commercial glass containers are subjected to impact tests. Here, a one-way beer bottle is tested.



But the most important legacy of the war so far as packers are concerned is not the probably higher level of annual production. It lies in the new developments of container design and glass handling equipment.

First as to container design—it is not too much to say that the wartime emergency provided the first full-scale demonstration, to packer and glass manufacturer alike, of the practicability of standard design. In the glass industry, a "standard" is not an arbitrarily chosen contour or capacity. At least four factors are concerned. The term "standardization" applied to glass containers is a composite of simplification, industry-wide availability, efficiency of use on the filling lines of the greatest number of packers and efficiency of production from a manufacturing standpoint.

The two considerations prompting standardization of glass containers during wartime were maximum production and the conservation of materials. It has been estimated that approximately 20 per cent more glass containers were made possible by the standardization order; and not only were there more bottles and jars, but they were, on the average, larger.

But aside from accomplishing the primary wartime objectives, standardization demonstrated the ability of the industry to engineer standard designs which combine the qualities of practicality and attractiveness for the packer and the characteristics making possible efficient production by the manufacturer.

An increase in the number of container designs is bound to occur when the standardization order is relaxed. The moldability of glass offers a very tempting opportunity for a packer to obtain an exclusive appearing package. Furthermore, progress is made by experimentation which tends to be stifled under too rigid a standardization program. However, the lessons taught by the war will remain, and it can be expected that the volume of standard containers will be a large, and perhaps a preponderant, part of total volume.

Partly as a result of this standardization, a second important development is becoming noticeable—a greatly increased activity in improving the techniques and the equipment used in handling glass. With standard container dimensions as guides, machinery men can make better progress in the design of unscramblers, washers, conveyors, cappers, processing equipment and the like. Moreover, with a wider use of "standards," they can expect a wider demand for their products. There is a new emphasis on the usage rather than the mere sale of glass, a new realization that a line tailored specifically for a glass operation will show returns in current and coming markets. (See *Handling Glass on the Production Line*, p. 392; *Fundamentals of Packaging Plant Layout*, p. 703.)

Principles of glass container design

by J. S. Algeo

A properly designed glass container must necessarily represent a compromise in the views of the three principal parties concerned: the glass manufacturer, the packer and the consumer. The transportation company might be considered as a fourth party, but if the container is designed to meet the needs of the other three, then it automatically will be proper from the standpoint of the carrier.

In the past it was too often true that a container was designed purely from a supposed merchandising angle and little or no attention was paid to the other problems involved. The resulting package was, in too many cases, impractical to manufacture and to handle through packing lines and, in addition, was too often a monstrosity in appearance.

Glass is a beautiful and versatile substance. Among others, it has three outstanding qualities: visibility, rigidity and the ability to be molded into an infinite variety of shapes. Because of these qualities, it can be formed into containers having utilitarian as well as artistic features. It was only during the past ten years that an effort was made to reconcile the conflicting viewpoints of the principal parties involved in the development of containers in order to take full advantage of the inherent qualities of glass. Great progress has been made, but much remains to be done. The expert designer has become a full-fledged member of the staff of glass manufacturing companies. The designer has reconciled differences between the various parties. He has utilized the qualities of glass as well as the improvement in glass-making techniques.

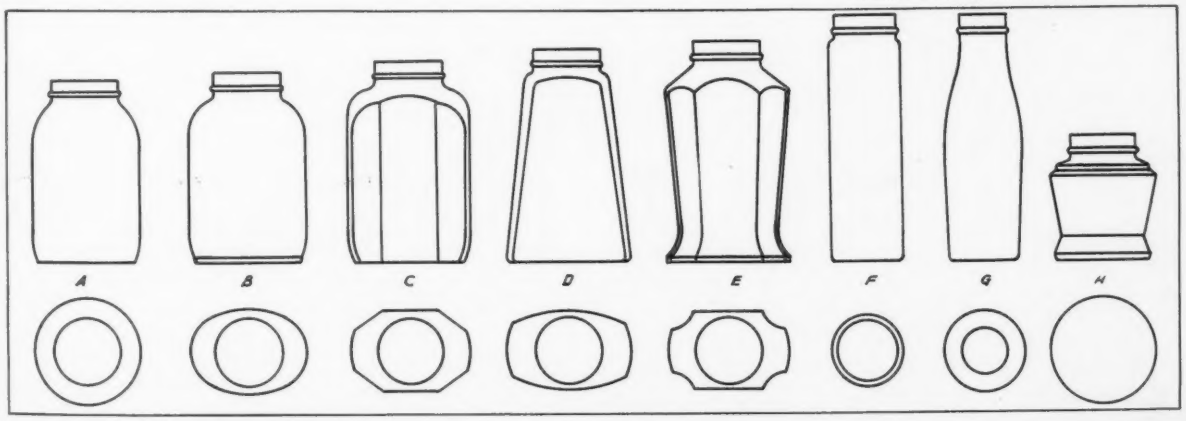
Today, we have containers which are much lighter, much stronger and much more beautiful than their counterparts a two decades ago. Lighter weights have come about for two reasons. Firstly, because the manufacturer has learned that the elimination of sharp corners and depressed panels will permit a weight reduction with added strength. Secondly, improved processes have enabled the manufacturer to blow glass with more even distribution, so that but little compensation need be made for thin and thick spots.

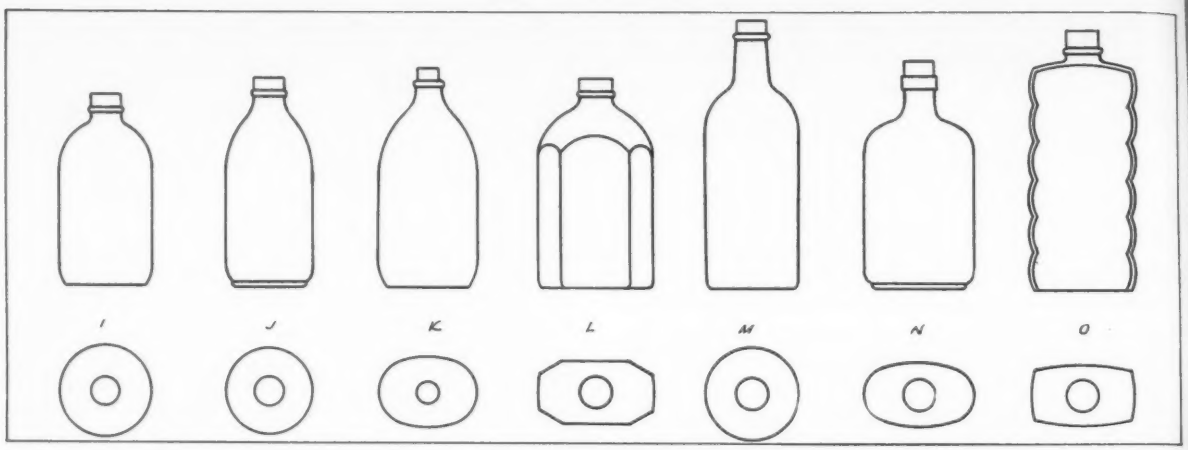
Improvement in design has come about because skilled designers have applied their artistry. The designer has gained a knowledge of the needs and limitations of the glass manufacturer, the packer and the consumer. He has succeeded in creating packages which the manufacturer can make at lighter weights and higher speeds; which the packer can put through his lines at high speeds, at minimum costs, with little breakage; which the consumer finds more useful and more beautiful.

Glass containers are made by two processes—the simple "pressing" method and another method which is a combination of pressing and blowing and which is usually spoken of as the "press and blow" method. Since by far the greater volume is made by the "press and blow" method, this article will deal with such containers, although many of the remarks will apply as well to those made by pressing. In the following paragraphs an attempt will be made to point out the requirements of a good design from the viewpoint of each of the three interested parties.

1—Designs for jars: (A) Ideal relation of height to thickness is shown by round plan with tapered shoulders and pulled-in foot; (B) Oval plan increases heaviness; (C) Addition of paneling lessens desirability; (D) Reduced manufacturing speed and added weight result from increased height, taper to wide bottom and sharp corners at base; (E) Bad example is rectangular plan with sharp corners and foot—result is poor distribution of glass, or use of excessive amount with resultant loss of manufacturing speed; (F) Disproportionately tall cylinder causes unsatisfactory weight, from which (G) also suffers; (H) Sharp corners and foot handicap manufacture—plain shape with well-rounded shoulder and minus foot, in this proportion, is generally considered far preferable.

DRAWINGS 1, 2 AND 3, COURTESY HAZEL-ATLAS GLASS CO.





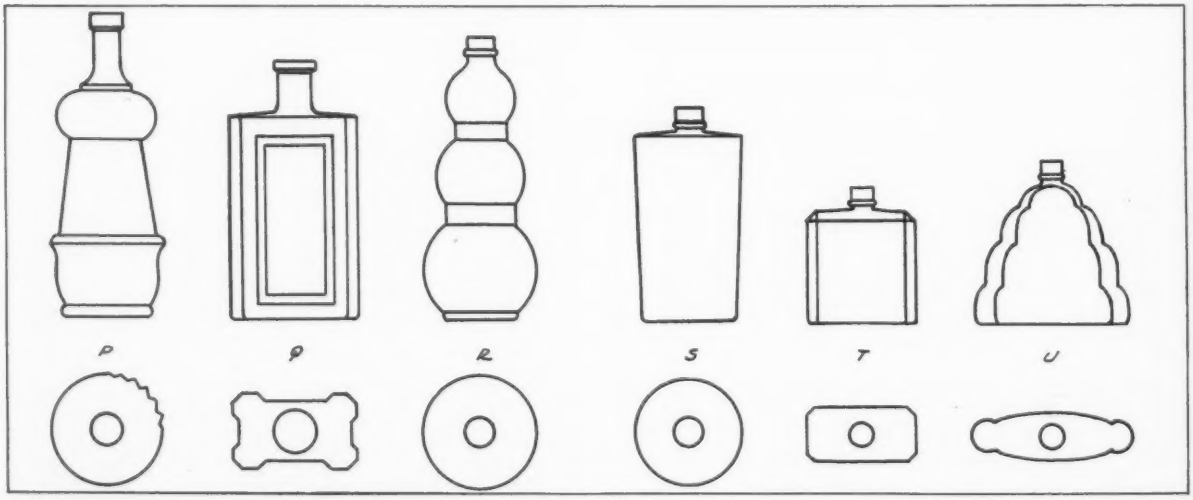
2—Bottle designs: (I) Ideal shape is illustrated by round plan with well-rounded foot and shoulder; (J) Slightly increased height makes this bottle less acceptable; (K) Greater height and oval plan decrease desirability, but not efficiency; (L) Manufacturing speed is retarded and weight added by greater width, less thickness, use of panels and square corners at base; (M) Despite round plan, greater height and long neck reduce efficiency; (N) Comparatively thin oval plan, plus the neck, require a fairly high weight for this bottle; (O) Extreme height, relative thinness and decorated ends which restrict pouring make production difficult.

From the glass manufacturer's viewpoint

Without going into a technical explanation, it will be sufficient to say that a glass container is made by pouring molten glass at a temperature of 2400–2600 deg. F. into a mold and then blowing it out by means of compressed air. The glass flows evenly from the center line. The farther it is blown, the thinner the wall becomes. If it is blown farther in one direction than in another, as in the case of a rectangular shape, it is thinner on one side than on the other. If it is blown into a sharp corner, it blows thinner to a greater degree.

It follows that the most practical and economical design is a plain round with well-rounded shoulders and heels (the curve between the side and bottom), without depressed panels, with perpendicular sides and with the proper relationship between height and width. In the case of jars, the neck should be enough smaller in diameter than the body to produce a pronounced shoulder. In order to achieve the lightest, strongest, and therefore the most economical container, the proportions of height to width must be properly related. Roughly, the most economical jar is one whose height is $1^1/_2$–2 times the diameter. In the most economical bottle, the height should be 2–$2^1/_2$ times the diameter. As the height increases beyond these ratios, the weight likewise increases and machine speeds decrease. As the ratios decrease, other complications arise. For instance, if the neck opening is narrow in relationship to the body diameter, the glass will blow too thin in the shoulders, thus requiring extra weight to compensate. It is not to be construed that a container is impractical to make if these ratios are not observed. Generally speaking, however, it is true that the farther away from this

3—The varied shapes shown below depart in an obvious manner from the ideal. Each of them presents some problem in glass distribution, thus requiring excess glass weight and necessitating reduction in machine speeds.



happy medium a container is, the more it will cost to produce and the less strength it will have.

When a departure is made from a plain round container, sharp corners, depressed panels and excessive decoration should be avoided whenever possible. In oval and rectangular shapes, there should be a low ratio between the two diameters; the relationship between height and diameter should be as near to the stated proportions as the particular circumstances will permit; and the sides should be as nearly perpendicular as it is possible to make them.

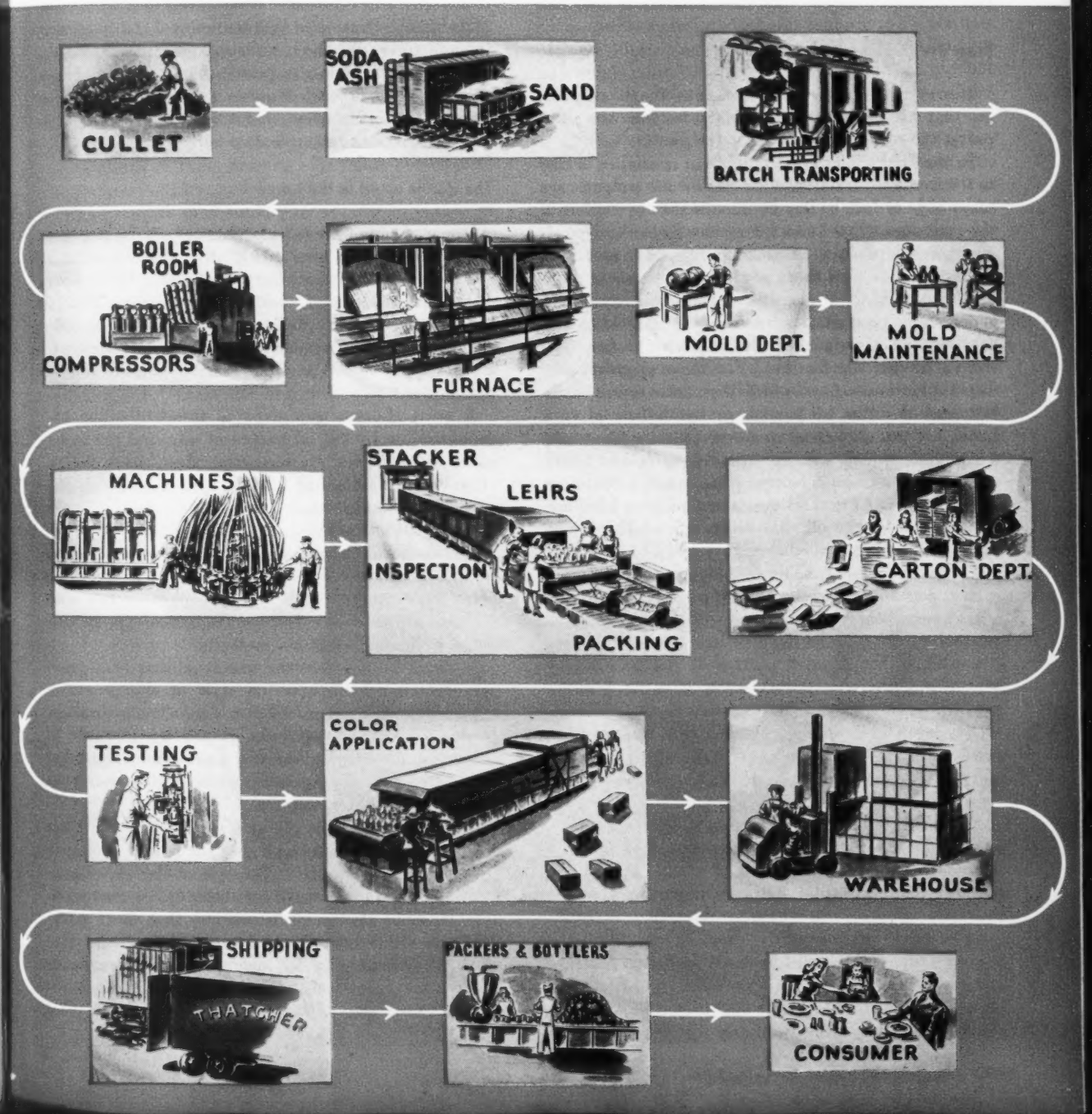
From the packer's viewpoint

In considering a glass container, the packer naturally has two objectives. The first is to use a container which will go through his factory operations at the lowest cost, which means at the highest speed, with the fewest operations, and with the least breakage. The second is to use a package which will find favor with the ultimate consumer.

Fortunately, the packer's interests coincide with the glass manufacturer's so far as the first objective is con-

4—Flow-chart showing step-by-step procedure for the manufacture of glass, from cullet to ultimate consumer.

DIAGRAM, COURTESY THATCHER MANUFACTURING CO.



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cerned. The manager of the packer's factory wants exactly the container which the glass manufacturer prefers. He wants a container with perpendicular sides and a low center of gravity so that it will ride on his conveyors without tipping over and go through his filling, capping and labeling machines at high speeds without jamming or breaking. He wants containers with sufficiently wide openings so that the maximum filling speeds can be attained, and he wants plenty of labeling area so that, if necessary, labels of different sizes may be used. The needs of the packer, from his factory standpoint, are so nearly identical with those of the glass manufacturer that no further comments are needed. (See *Production Considerations*, p. 52; *Handling Glass on the Production Line*, p. 392.)

From the consumer's viewpoint

However, the packer cannot use exactly the containers that his plant manager prefers, because the third party, the consumer, comes into the picture.

In the final analysis the fate of the container is held in the hands of Mrs. Consumer. If she has a choice, she often buys or fails to buy because of the appearance of the container. She looks for various features, depending upon the product. A great number of products are packed in glass, and these products or classes of products necessitate differing features in the container. When staple products, such as foods, household chemicals or polishes are packed, the utilitarian feature outweighs the artistic feature. For these products, she wants a container from which the contents can easily be removed either by pouring or by the use of such handy kitchen utensils as spoons or knives. She wants a container which will fit on refrigerator or pantry shelves without tipping over. She wants a container with a large label area so that a conspicuous label can be applied. Above all, she wants a container which will not break.

At the other end of the line are high priced cosmetics, such as perfumes. For this class of product, the artistic appearance is primary and the utilitarian feature is secondary. The cost of the glass and the cost of filling it constitute but a small portion of the price which Mrs. Consumer pays, therefore less attention need be paid to the problems of the other two parties. Nevertheless, even in designing containers for the most expensive cosmetics, account must be taken of the packer and the glass manufacturer, although to a lesser degree than in the case of low cost staples.

Medicinal, liquor, wine and other products occupy a position between staples and cosmetics, and for that reason the utilitarian feature is of somewhat less importance than for staples, but more important than for cosmetics. The reverse is true for the artistic feature.

As to re-use containers, the trend in milk bottles is toward designs which can be made in lighter weights and which will take up the least room on refrigerator shelves, but which will still be sufficiently strong to withstand many trips. The trend toward space saving is especially pronounced and should be kept in mind in designing such containers.

There seems to be no change in the trend of design for re-use beverage (soft drink) bottles. Such bottles are made of individualistic shapes, and designs are usually patented. They are made at heavy weights and of sturdy construction to withstand many returns, together with extremely rough handling. There is little likelihood of any degree of standardization of this class of bottle in the near future because the bottle cost per drink is exceedingly small and because of the enormous expense that would be involved in changing plant lines, cases, trucks, advertising copy, and so on, in order to use radically different bottles.

The trend in returnable beer bottles is toward complete standardization so that bottles made by numerous manufacturers may be run through packing lines without adjustments being required. The standard shapes are plain rounds, well designed from the glass manufacturer's point of view, and comparatively heavy in order to withstand many return trips.

The design trend in the future

The glass container industry has not yet developed to a mass production level. Until the past few years it conducted its business pretty much on a "job" basis although its plants and equipment were more suitable for mass production. Ten years ago it started to redesign its containers in order to get stronger containers at lower costs and at the same time to simplify and to standardize them.

A great impetus was given to standardization and simplification by the necessities of war, and the movement will continue to have its effect upon design. However, it must not be thought that all glass containers will be standardized. The cost of containers for certain products which are widely used, such as staple foods, household chemicals and some beverages, constitutes a considerable portion of the total cost. Of necessity, these products will be packed in the most economical containers, and the containers will be produced by mass production methods.

In those cases where the merchandising of a product depends greatly upon its style or artistic effect, there will be little or no effort toward standardization. In designing such containers, it will be desirable to keep in mind the limitations of the glass man and packer to the greatest degree possible without minimizing the sales appeal for Mrs. Consumer.

Although this article pertains to the glass container only, it must be remembered that the label and closure are parts of the package. Because of the use of containers of generalized shape for staple or low-cost products, it seems reasonable to assume that more effort than ever will be made in the future to gain distinctiveness and individuality by means of greater emphasis on design of closures and labels. (See *Labels-Seals-Tags-Marking Pieces*, p. 287; *Pictorial Review of Closures*, p. 379.)

Closures–finishes–liners–seals

Considered as a package, a glass container is as successful as its closure, and the success of the closure depends upon the finish of the bottle or jar, the closure form and fit, and the seal effected by the liner of the closure.

The *finish* of a glass container is the region designed for the application of the closure. It is so called because, in the old hand blowing days, it was the last part of the bottle to be shaped.

Since this finish is the bridge between the glass bottle industry and the closure industry, it is obviously essential that the dimensions of the finish be common property of both manufacturers. For this reason, the Glass Container Association standardized all of the types of commercial finish for which closures are made, and the specifications of these finishes were made available to all producers of glass containers and closures (Fig. 2).

These finishes may usually be applied to bottles of any design. So far as the prospective purchaser is concerned, all he has to do is to determine the type and size of bottle or jar he desires and the type and size of closure. When the shipments of glass containers and their closures arrive at the plant, the GCA standardization of finishes makes possible an accurate fit.

Approximately one hundred finishes have been standardized. These are designed for all commercial closures.

Types of closure

Primary closures—The primary closure of a glass package is the one that has any portion of its inner surface exposed to the contents. Its function is to seal the bottle and to remain securely in place until the consumer opens it. Every primary closure comprises:

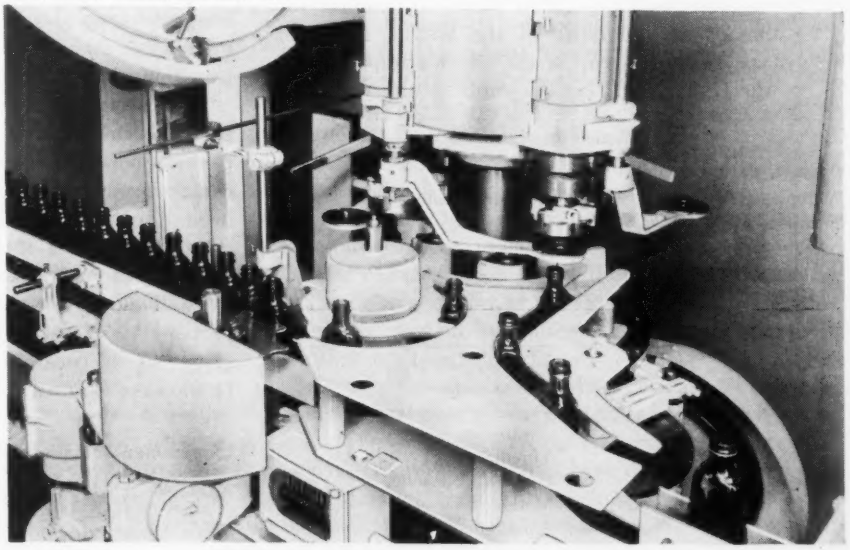
1. A sealing surface, to be pressed against the sealing surface of the container
2. A cover portion for the mouth of the container
3. Some means of securing closure to container

The sealing surface of a closure is usually a gasket or liner (which is not affected by the product) backed with a compressible material which will conform to the contour of the sealing surface of the container. The gasket may be a single material which combines both the "product resistant" qualities and cushion (compressible) qualities —for example, rubber, cork, etc.

The first thing the packer must know about his closure is whether it provides the degree of sealing required by the product. Properly applied, a closure may be airtight, liquidtight or simply siftproof. It may be designed to hold internal pressure of varying amounts, to vent and re-seat after venting, or to hold a vacuum. The degree of sealing depends primarily upon the nature of the material used for both liner and backing and the pressure exerted by the cap on the liner.

Closure types may be more clearly discussed by classifying them according to the methods used to secure them to the finishes. The sealing surface of the bottle may be on the inner surface of the neck, on the top of the neck or on the outer surface of the neck. Therefore, closures are designed for inner seal, top seal or side seal. The *inner* seal is formed at the inside periphery and below the inner edge of the container mouth. The *top seal* is formed on top of the container rim. The *side seal* is formed on the outside periphery and below

PHOTO, COURTESY PNEUMATIC SCALE CORP., LTD.



1—In order to ensure a perfect seal on bottles, the torque exerted by the clutch of the capping machine must be adjusted very carefully. Here, filled bottles are fed to the individual heads of a rotary capper and discharged at right.

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the outer edge of the container mouth. Thus classified, closures fall into five types:

1. Friction closures: These, forming inner seals, may be tapered, ground-surface, glass plugs. The most popular friction closures are cork stoppers. They may have straight sides (wine and whisky), tapered sides (miscellaneous jugs and flasks), champagne style or cored for use with sprinkler tops or applicators. The corks may have tops of plastic, wood, metal or wood covered with metal. Side seals by friction only are most common on tumblers. On jars, combinations of side friction and vacuum are frequently used, and the glass finish is often provided with a ledge for pry-off opening. Vapor vacuum, steam vacuum or other vacuum-sealing processes often employ friction side-sealing together with vacuum sealing.
2. Screw closures: May be deep or shallow caps, the deep screw having a skirt about one-third deeper than the shallow. They may be single shell, with the threads exposed; double shell, with the threads concealed in an outer casing; or the outer casing and concealed thread may be made of a single piece of metal. They may be of metal or plastic or both. The caps may be knurled, semiknurled or unknurled. The skirt may have an outwardly rolled edge, a raw edge or a turned-in rolled edge. The top may be domed, partially domed, flat, or have a depressed ring. Lug caps are variations of screw caps, since the lug acts as an interrupted thread. The lug may be made by indentations in the skirt, or by turned-in projections on the edge of it.
3. Formed closures: The most familiar of the caps formed on the finish of a bottle is the crown cap, used for beer, carbonated beverages, condiments. Another type of formed cap is the *roll-on*—a piece of ductile metal in which the threads are formed by the capping machine (during cap applications at the packer's plant) to conform to threads on the finish of the bottle. Another type of formed cap is the chuck-crimped type where the chuck on the capping machine collapses or squeezes the skirt of the cap, or the gasket in it, against the side-sealing surface of the particular finish.
4. Vacuum only: Caps, under which vacuum may be obtained by special sealing machines, by cooling and contraction of hot packed product or by some combination of these methods. (See *Vacuum Packing in Glass*, p. 390.)
5. Miscellaneous and combination caps: The band-cap is an example of this type. It is one in which a metal band applied with a sealing machine has its lower edge crimped under a ledge on the container finish and its upper edge crimped over the top corner of a sealing disk or cover, which often is also held under vacuum. A tear-off, or separate removable band around the finish of a container is often used as a supplementary seal to hold a cover cap in place and to prevent it from accidentally becoming loose. When made an integral part of the primary closure the supplementary seal protects against tampering.

Many further variations of the other four main types have been developed for specific products. The packer is sure to find several appropriate types.

Secondary closures—A secondary closure is one that does not come in contact with the glass-packed product. It may be used: 1) as a dust cover to keep the whole neck of the bottle or jar clean for dispensing purposes, 2) as a cover for whatever part of the product remains in the container after the primary seal is removed, 3) as a decoration to "dress up" the package, 4) to hold the primary seal in place, 5) to prevent tampering.

Among the secondary closures are the so-called cover caps, frequently used to protect the primary closure or pouring edge of a bottle. Many milk bottles have cover caps of paper or (formerly) aluminum foil; distillers often used a hood of gold or silver foil over the cap to dress up the package. Catsup cover caps made of tin plate are used as covers for partially filled bottles after the primary closure, such as a crown or formed cap has been removed. Many secondary closures are made of cellulose cups, either opaque or transparent, sealed over the primary cap on the finish.

In this classification also fall a variety of tamper-proof closures, usually metal strips which bind the primary closure and must be destroyed before the bottle can be opened. Here, too, is the cellulose disk applied inside the primary closure, secured by an adhesive to the sealing surface of the bottle.

The virtues of packaging in glass under closures are too well known to require further description. For the proper type of closure and glass finish to specify for a given set of packing conditions, consult the manufacturers of closures and glass containers.

Government material controls

It would be impossible in an article of the present scope to include complete details of the closure limita-

SIMPLE LINERS

Pulpboard	White felt
White waxed paper	Waxed saturated pulp
Saturated pulp	Plastic wax
Natural cork	Rubber (various types)
Cork composition (various types)	Special solvent (various types)

DUPLEX LINERS

BACKINGS	FACINGS
Newsboard	Waxed paper
Pulpboard	Varnished paper (various types, Silite, etc.)
Cork composition	Vinylite
White felt	Panaseal or Raolin
Tan felt	Metallic foils—tins
Gray felt	Aluminum and lead

tions imposed by the Government during the war. Some of these restrictive orders of necessity are still in force, notably order L-103-b, and it is impossible at the present writing to say when they will be revoked. The postwar shortage conditions appear to be as burdensome as the conditions during the actual war years. These conditions have been aggravated by strikes in basic industries. Consequently, it is still necessary to observe principles of conservation by the following methods:

Reduction of size of closures
Elimination of smaller packages
Elimination and/or reduction of tin coatings
Elimination and/or reduction of rubber for sealing
Elimination and/or reduction in use of steel
Conservation in use of protective coating materials

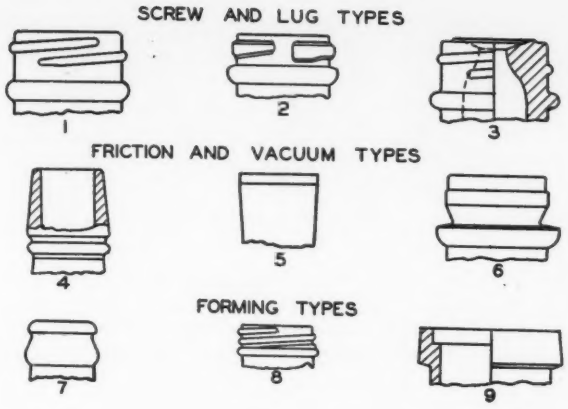
Substitute closures

The use of substitute closures will probably continue to be a necessity. Because of the various hazards, it is not easy to find satisfactory materials from which substitute closures can be made for the following reasons:

1. Tolerance requirements of glass make a yielding cap and cushioned gasket material necessary.
2. There must be a means for mechanical adherence of the closure, by vacuum, friction, threads, lugs.
3. A closure must hold until it is ready to be removed, then it should come off easily.
4. Closure materials should not be appreciably affected by moisture.
5. The finished closure, if of a screw type, should be able to withstand a torque of 15–40 in. lb. without break or distortion, and should be removable with about the same amount of force.

The highly satisfactory closure of prewar days depended on three materials—metal, plastics and rubber. These materials, nearly a year after the cessation of hostilities, are still in very short supply. Some improvements have been made and it is probable that many of the makeshifts and temporary measures adopted during the war days will not have to be used. Some of these substitutes—particularly those for crown caps—proved impractical for several reasons. For one thing, they were not adapted to high-speed bottling machinery and, therefore, could not be economically applied on present packaging lines.

Screw caps made of paper, glass, ceramics and extended plastics, even of cork and wood, were put into service, but most of these have now disappeared because of a very considerable improvement in the metal situation. True, wood closures in novelty form will continue to appear on cosmetics and toiletries, but they will probably not find a permanent place in lower-priced mass production products. The paper closures that did such a necessary substitute job during the darkest shortages have pretty generally disappeared from the market.



2—Standard bottle finishes: (1) shallow continuous thread; (2) two-lug American seal; (3) glass sprinkler top; (4) brandy cork; (5) tumbler friction; (6) deep friction pry-off; (7) crown; (8) roll-on; (9) band.

Liners and sealing compounds

The liner manufacturers are still suffering: the demand for liners has considerably increased: there is, of course, a scarcity of oils and resins for producing the varnished-paper type of liner; those made from rubber, such as Panaseal and Raolin, are not obtainable. Vinylite has been needed for essential war uses, and only a limited supply has been available for essential closure needs, although some of this material is expected to be available soon. A new lining material produced from Koroseal was introduced in 1943. This material is somewhat similar to Vinylite, since the formula of each is based upon the vinyl resins. The Koroseal material can be used to replace Vinylite, and for all practical liner purposes, is equivalent. Liners produced from pure gum rubber are not yet generally available for packaging.

Liner materials now available include the following:

Regular yellow varnish paper—Used on food products, such as peanut butter, mayonnaise, prepared mustard, salad dressing, as a spot for crowns, especially for soft drinks and on a variety of products.

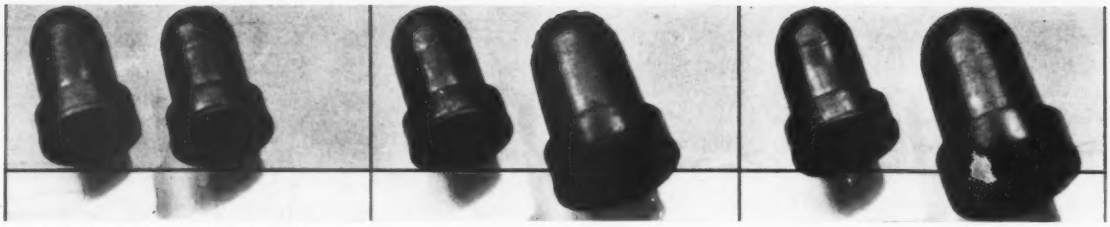
Black alkali paper—Primarily developed for milk of magnesia use, although this material finds general acceptance for many pharmaceuticals and certain dry chemicals. Black alkali has been used on liquors, although it is not as good as Vinylite or Panaseal for this type of packaging application.

Pale yellow varnish paper—This paper is generally not quite as resistant as the regular yellow and is used where the particular customer may, for one reason or another, desire a lighter liner.

Harvel—This special paper has been used for products containing certain types of solvents and has been used also on liquid deodorants and certain shoe polishes.

Whiteseal—Whiteseal has been widely employed as a substitute for tin foil in sealing products containing organic solvents. Whiteseal is likewise being used

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PHOTO, COURTESY PENNSYLVANIA GLASS PRODUCTS CO.

3—Since natural rubber droppers swell and become distorted in contact with oils, an odorless, oil-resistant synthetic rubber dropper has been developed for use with oily products. In these illustrations, a synthetic rubber dropper is shown at the left, one of natural rubber at the right. The first picture shows them before manufacturer's test; next, the same bulbs after 24 hr. in kerosene; finally, after 48 hr. in kerosene.

currently on liquors, face creams, cold creams and other products, as a substitute for Vinylite or Panaseal.

Of the varnished papers, black alkali paper is probably the one which is most universally employed and could be used quite generally. Its dark color has been the main reason that it is not used on many more food products; for instance, it could be used satisfactorily on peanut butter and mayonnaise. However, the regular yellow paper is more nearly the color of the product; consequently, it seems to be more acceptable.

Vinyl resin copolymer—Although there is a shortage of this material, it is available for foods and pharmaceutical products in reasonable quantities.

Rubber hydrochloride sheeting—The appearance of this sheeting is quite similar to that of vinyl resin copolymer but in view of the scarcity of rubber, this material is not at present available for closures.

Cellophane—For liners requiring resistance to solvent action, cellophane is widely used because of its efficiency in this respect.

Nitrate and acetate films—These films have been used in the past but in relatively small quantities. They were under limitation order during the war, and the materials are still somewhat scarce.

Plastic wax liners—These liners consist of pulpboard with a heavy coating of plasticized wax and have been widely used in the past on food containers. From present indications their use is still possible in all quantities.

Recently developed papers include lacquered glassines and papers coated with solutions of urea-formaldehyde and various resins. These papers have their uses where normal oil papers would be soluble.

Glass-fibre liners—Limited quantities of glass-fibre liners have been used but these are not now available except under special circumstances. Generally speaking, there is high priority on them and they may be used only for sealing of concentrated chemicals, such as acids.

Foil liners—Tin foil is practically nonexistent and it is impossible to predict when this situation will improve. Aluminum foil has been satisfactorily used in crown caps where the pressure of the capping machine is sufficient to ensure a perfect seal; but the milder torque of other capping devices leaves something to be desired for the aluminum liner. The material itself is in satisfactory supply.

Structure of liners

Liners may be divided into two classes; namely, simple and duplex. By simple liners is meant a liner of a single material, treated or untreated. A duplex liner consists of a backing faced with a material which is resistant to the product, the backing being used to support the facing and to take up the space between the sealing lip of the container and the closure so that a tight seal is made.

Plain pulpboard and white felt can be used for retaining products which are dry and nonhygroscopic. For powders, pills or capsules, which are only mildly hygroscopic, a white waxed paper, saturated pulp or waxed saturated pulp is indicated. Cork composition (either plain or waxed) will protect hygroscopic products, and is used for narrow-mouthed packages.

Rubber or rubber substitute liners are quite generally used for alkaline products, such as household ammonia, the hypochlorites, mild acids, tincture of iodine and cuticle remover. A pure gum rubber (minimum amount of free sulfur) is generally supplied for solutions to be used for injection purposes.

In addition, special liners have been developed which are resistant to solvents. They may be used in caps with posts or wells where a washer-type liner is indicated and also on corn cures and solvent adhesives.

Duplex liners consisting of a backing and a facing are the liners which appear to be most generally used for closure purposes.

The most common backings consist of pulpboard, newsboard or cork composition. In metal caps, double insertion is often used, in which the backing and facing are not combined, but the superimposed materials are punched directly into the caps. In molded caps it is customary to adhere the facing to the backing with a tasteless and odorless adhesive.

Several different grades of cork composition can be supplied. Cork particles may be either large or small in size range, and different degrees of resiliency may be produced according to the variation in densities in the different compositions.

As a guide for the study of available liners which might be used, Table I indicates a possible selection. Liners formerly used are indicated by the letter "F." However, it should be remembered that each product

should be subjected to proper laboratory tests before a substitute liner is used.

There is really only one good way to determine whether a liner will work and that is to conduct actual tests. The products which are official in the *British Pharmacopoeia* or in the *United States Pharmacopoeia* and *National Formulary* can be studied in the laboratory and a definite liner recommendation can be made.

It would be impossible to make a general recommendation for the nonstandard or unofficial products. Likewise, it would be foolhardy to attempt to make a general recommendation for liquid glues. Some of them are alkaline in their nature, some of them natural, others acid, and since glue is a general term for adhesives, the solvent type of adhesive, such as cellulose nitrate, might be classed under the same category. The cellulose nitrate types, which are solvent solutions, require a metallic foil as a liner (currently Whiteseal as a substitute), while the acid animal glues would definitely corrode the tin foil. Here Vinylite, or possibly black alkali paper (if the acid is not too strong), might be used.

It is general practice to conduct accelerated tests on the various lining materials. These consist of using a 1-oz. bottle with 28-mm. finish. Caps are lined with the test materials. About $^1/_2$ oz. of the material under test is introduced into the bottle, and the cap is applied with a standard tightening force of 33-lb. tangential pull or 17.9 torque inch-pounds. Duplicate sets are put up and are then subjected to elevated temperatures, one bottle in upright position and the other in inverted position. A temperature of 150 deg. F. is used for the products which are not volatile. The volatile solvents are held at 120 deg. F. both in upright and inverted positions. After an exposure of 48 hr., the samples are removed from the oven and permitted to come to room temperature, after which they are visually examined to note what action has taken place and the liner is then scratched with the fingernail to determine whether the facing has been softened or not. Moisture transmission tests are always conducted in the standard manner.

Other characteristics of the papers, such as resistance to bending, brittleness, uniformity of coating, of course, must be evaluated. The paper must have the ability to be properly attached to a backing material, such as pulpboard or newsboard or to cork composition with the various types of adhesive commonly used.

TABLE I—SUGGESTIONS FOR LINERS OR FACINGS

	Varnished paper	*Tin foil*	*Silite Whiteseal Impervite*	*Vinylite*	*Panaseal Raolin*	*Waxed paper*	*Rubber or substitute*	*Special*
DRY POWDERS	XF	...	X	F	F	XF	...	...
MINERAL ACIDS:								
CONCENTRATED	...	...	...	...	...	...	...	XF
WEAK	...	...	...	?F	?F	...	...	...
ALKALIS:								
CONCENTRATED	...	...	...	...	...	...	X	...
WEAK	...	...	...	?F	?F	...	X	...
SOLID	...	...	...	?	?F	?	...	...
ALCOHOL:								
U. S. P.	X?	F	...	XF	F	...	...	...
DENATURED	X?	F	X	XF	F	...	...	...
BLEACHING SOLUTION	...	...	...	XF	F	...	X	...
ADHESIVES:								
LIQUID	X?	...	...	F	F	...	...	X
SOLVENT TYPE	...	F	X	...	...	...	...	...
COSMETIC CREAMS	X	...	...	F	F	?	...	...
CORN CURE	...	...	...	...	...	...	...	X
FOODS:								
DRY	X	...	X	F	F	X	...	...
OLIVE	X	...	...	F	F	...	F	...
RELISH	X	...	...	F	F	...	F	...
MAYONNAISE	X	...	...	F	F	...	F	...
PROCESSED	...	...	...	...	...	...	X	...
LIQUOR	X	F	?	F	F	...	...	...
NAIL POLISH	...	F	X	...	...	...	...	X
NAIL POLISH REMOVER	...	F	X	...	...	...	...	X
OILS:								
ANIMAL	X	F	X	F	F	...	...	...
MINERAL	X	F	X	F	F	...	...	...
VEGETABLE	X	F	X	F	F	...	...	...
ESSENTIAL	...	F	X	...	...	...	...	X
ORGANIC SOLVENTS	...	F	X	...	...	...	...	X
PERFUME AND TOILET WATER	?	F	X	...	...	...	...	...
PHARMACEUTICALS	?	?F	?	?F	F	...	...	...
WINE	X	...	...	F	F	...	?F	...

F—Formerly used.
X—Facing can be used with these products.
?—Liner probably can be used.

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PICTORIAL REVIEW

Metal Closures
Screw Type



1. *45-mm. continuous-thread closure, full dome, no knurl, wire edge.*

2. *G deep screw closure, flat top with sealing bead, knurling, interrupted thread, wire edge.*

3–4. *28-mm. and 45-mm. continuous-thread closures, flat top with sealing bead, knurling, wire edge.*

5. *G 2-piece deep screw closure, gasket-lined disk (lithographed for sale as a home-canning closure).*

6. *60-mm. continuous-thread closure, flat top, no knurl, turned-in wire edge.*

7–8. *Continuous-thread closures with indentations to permit venting of internal pressure.*

9. *G deep screw closure, flat top with sealing bead, knurling, wire edge.*

10. *One-piece straight-side closure with continuous thread in turned-in skirt ("Unishell").*

11. *63-mm. continuous-thread closure, flat top with sealing bead, knurling, wire edge.*

12. *Semidouble shell continuous-thread closure (shell with threaded band in skirt).*

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OF CLOSURES



1. *Side-seal closure for jars and tumblers.*

2. *Side-seal closure for thin blown or light pressed tumblers.*

3. *Side-seal closure, pressed-on type for jars.*

4. *Side-seal closure for lubricating oil containers.*

5. *Band closure consisting of disk and tab-locked band (one closure inverted to show interior and band lock).*

6. *Band closure (inverted to show flowed-in sealing compound in disk).*

7–8–9. Vacuum cap closures for tumblers or wide-mouth glass jars. Rubber gasket ensures tight seal but permits easy opening.

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Metal Closures—2 Piece Screw Cap



1

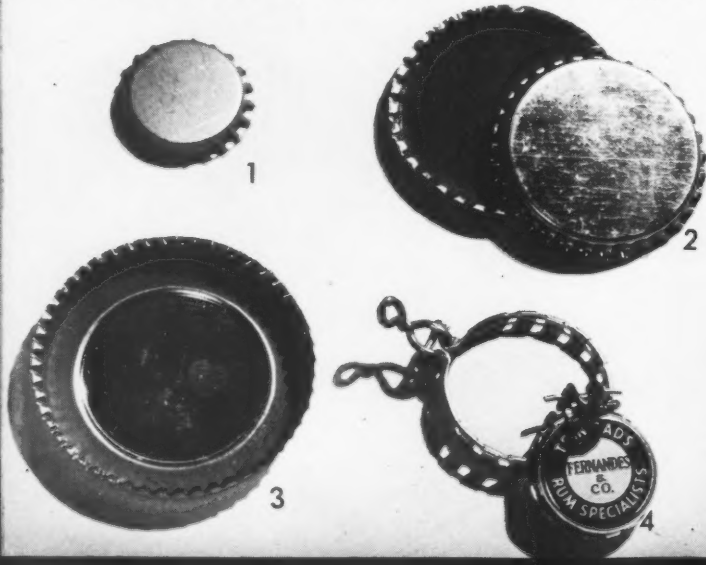
1. *Threaded metal closure with separate metal band which forms the thread. Top is flat or domed. Exterior lithographed ("Meritseal").*

Metal Closures Lug Type



1. *Closure with lug indentations which form vacuum pry-off finish, effecting water-tight re-seal.*
2. *Lug closure, flat top with sealing bead, knurling, wire edge (closure inverted to show waxed oil paper liner).*
3. *Lug closure, flat top, straight side, turned-in edge (inverted to show pulp and vinyl resin liner).*
4. *Lug closure, flat top, straight side, turned-in edge (inverted to show pulp and oil paper liner).*
5. *Lug closure, flat top with sealing bead, knurling, wire edge (inverted to show cut rubber or composition sealing gasket).*
6. *Lug closure (two lugs) knurled, with wire edge ("Amerseal").*

Metal Closures Crown & Lock Types



1. *Crown cap (used extensively for nonalcoholic and malt beverages).*
2. *Crown caps (large sizes for bottles and jars).*
3. *Crown cap with deep skirt and flowed-in sealing gasket.*
4. *Lever-lock closures (lifting lever permits hand removal of closure).*

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Plastic Closures
Screw Type



1. *Plastic continuous-thread closures (group illustrates assorted sizes with trademark designs).*

2. *63-mm. plastic continuous-thread closure, plain, round (inverted to show waxed vinyl resin liner).*

3. *48-mm. plastic continuous-thread closure, stock design ("Lustrseal").*

4. *Plastic continuous-thread closures (stock designs in many colors and sizes).*

5. *70-mm. plastic continuous-thread closure, plain, round (inverted to show pulp and vinyl resin liner).*

6. *Plastic closure with dispensing spout and miniature closure for sealing spout (used on lighter fluids).*

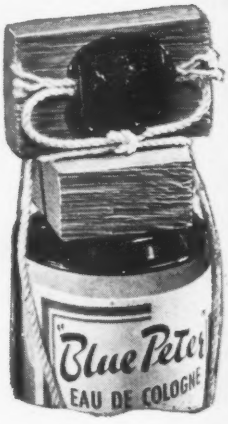
7. *Plastic continuous-thread closures, stock design ("Tassel").*

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Closures of Wood



1



2

1. *Wood closures for toiletries have standard metal screw cap inside wood top.*
2. *Novelty closure for perfume, metal screw cap in lower part. Adapted for hand packaging operation.*

Closures of Cork



1. *Tapered cork in general use for bottles, jugs, flasks, etc., made in a wide range of grades, tapers and sizes.*
2. *Champagne cork, oversize, driven into bottle under compression, making it assume cylindrical shape.*
3. *Cork flange-top closure, shape facilitates removal; used on whisky and products requiring tamperproof outer seals.*
4. *Cork closures with flange top, synthetic substitute for embossed wood or plastic top closure, for wine and whisky packages.*
5. *Group of small cork closures for vials, ampuls, etc.*
6. *Closure for laboratory use with apertures for pouring tubes, etc.*
7. *Wedge-top cork (ordinary tapered cork with formed top). Widely used for perfumes and cosmetics.*
8. *Cork with aperture for sprinkler or dispensing top.*
9. *Cork-knob top for cork closure.*

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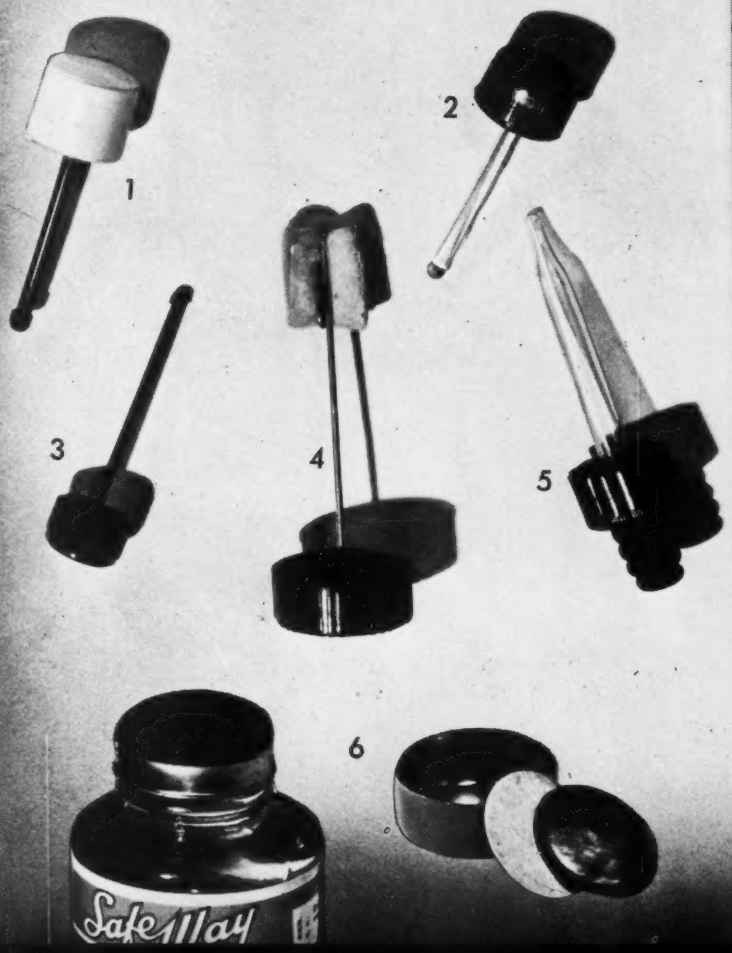
Glass Closures



1. *Glass closure, vacuum type. Slot at edge permits piercing cut rubber or composition sealing gasket to break the vacuum.*

2. *Glass closure, pry-off type, showing cut rubber or composition sealing gasket.*

Applicator Type Closures



1. *Plastic continuous-thread closure fitted with plastic applicator.*

2. *Plastic continuous-thread closure fitted with glass applicator.*

3. *Plastic continuous-thread closure fitted with plastic applicator.*

4. *28-mm. plastic continuous-thread closure fitted with wire edge and wool dauber.*

5. *Plastic continuous-thread closure fitted with glass dropper and rubber bulb.*

6. *Brush type closure for volatile cleaning fluid. Inner seal of foil prevents loss of contents during shipment, and metal cap fits over "brush" when not in use.*

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Secondary & Supplementary Closures



1. *Cap for use on demijohns, especially adapted for drinking water ("Saniseal").*

2. *Perforated inner seal on package containing hygroscopic powder; applies to lip of bottle with screw cap re-seal ("Sifta-Seal").*

3. *Inner seal for liquid products permits easy opening but prevents tampering ("Safety-Seal").*

4. *Secondary closure of paper used with metal closure adheres to container finish to prevent tampering with contents ("Safety-Seal").*

5. *Container for medical products with added cellulose band closure supplementing the rubber cap, to ensure gas-tightness.*

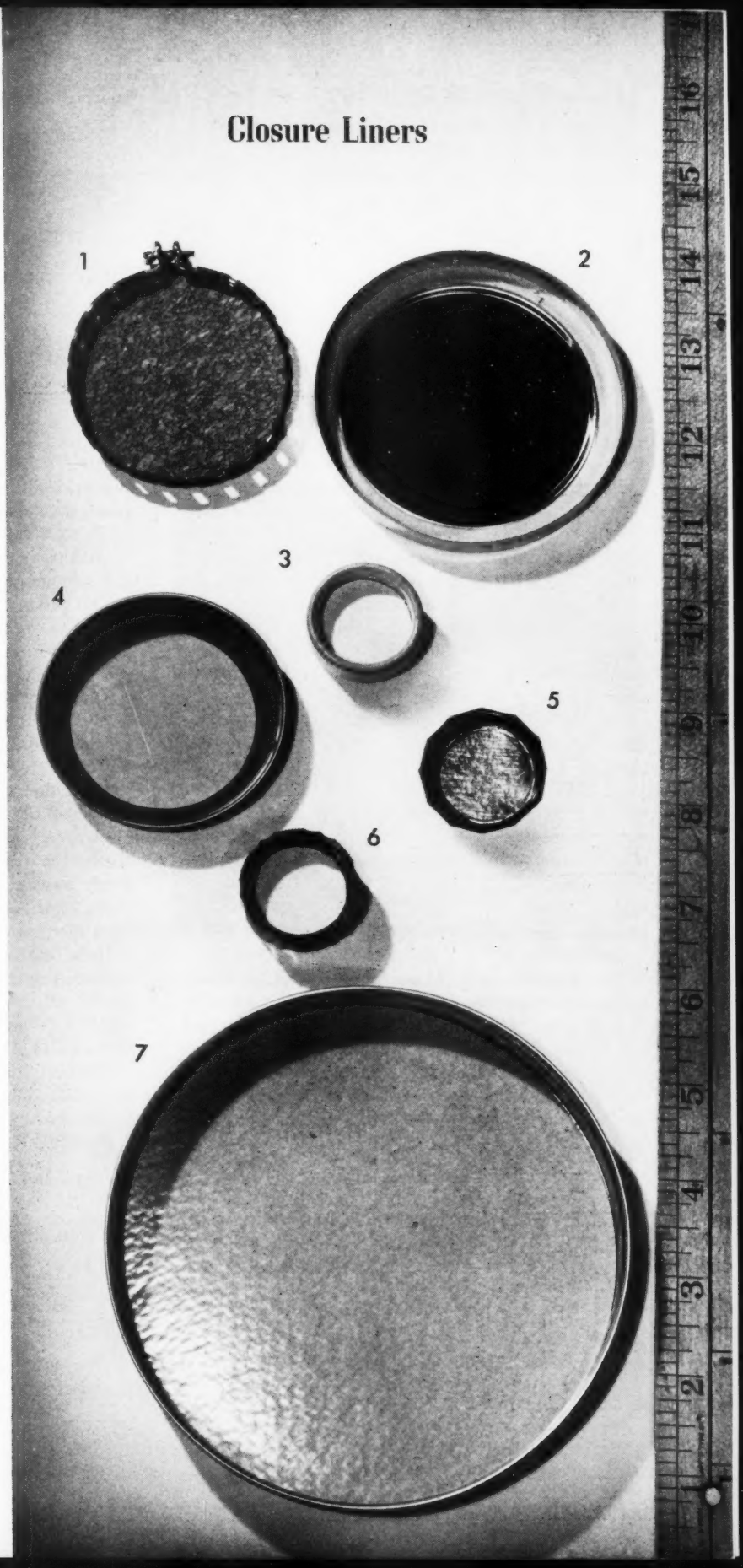
6. *Secondary closure employed for glass containers ("Sylvania Bands").*

7. *Liquor bottle with tamper-proof cellulose band second closure ("Cel-O-Seal"). Transparent windows in printed band show and protect tax stamp.*

8. *Coffee jar with cellulose band supplementing closure ("Cel-O-Seal") to effect gas-tightness.*

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Closure Liners



1. *Lever-lock closure with composition cork liner.*

2. *Band closure with flowed-in sealing compound in disk.*

3. *Continuous-thread closure with pulp and vinyl resin liner.*

4. *Metal continuous-thread closure with slip-type rubber or composition sealing gasket.*

5. *Plastic continuous-thread closure with metal foil liner.*

6. *Plastic continuous-thread closure with pulp and vinyl resin liner.*

7. *Metal continuous-thread closure with pulp and vinyl resin liner.*

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Handmade glass bottles

One of the major characteristics of glass, its moldability, has long made it an ideal material for distinctive packages. The merchandising of such luxury items as perfumes depends, to a large extent, upon the individuality of the bottle, a characteristic often best achieved with the handmade container. Thus, despite the progress of standardization in the glass industry, handmade bottles will be important for products which demand, and deserve, a precious and "different" container. This is especially so when the design requires fine work and when limited runs are needed.

For the manufacture of the great majority of the glass bottles employed in current packaging operations, modern automatic machinery is used. Glass is made in immense furnaces with materials which are mixed by the ton. The molten glass is fed into huge automatic machines and then blown accurately to conform to the shape of the molds within the machine. However, the ancient art of hand blowing still occupies a prominent—and an increasingly important—place in the packaging picture.

Until the start of hostilities in Europe, a limited quantity of French, Australian and Czechoslovakian glass which fell into this category was imported each year. Since September, 1939, however, American manufacturers of handmade glass have shown their ability to meet all the needs of the market, and virtually no dislocations have occurred due to the cutting off of former imports.

Miniature containers

The miniature hand-blown glass containers shown in Fig. 4 have recently been employed in the promotion of unit sales of perfumes. The stopper applicators, molded of plastic, are interchangeable. They are screw-threaded and sealed with a rubber ring to prevent slippage and evaporation. Designs are limited only by the imaginative scope of the artist and by the skill of the craftsmen.

As shown by the accompanying illustrations, perfume bottles and stoppers are frequently so glamorous in appearance that their decorativeness has nearly as much sales appeal as the liquid which they contain.

Manufacture of handmade glass

In the process of making a bottle by hand, the glass blower inserts the blowpipe, an instrument about 4 ft. long, into the pot of glass and withdraws a sufficient amount for the bottle, at the capacity required. A hand skilled in feeling the weights is imperative, as too much glass would decrease the capacity of the bottle, while too little would increase the capacity in addition to making it much too frail for handling conditions in the average plant.

The glass is then rolled on a smooth flat surface to eliminate any wrinkles that may have formed while the glass was being taken from the pot, leaving an almost perfect piece which is next placed in an iron or a steel mold.

Molds are made in two parts, each containing a cavity of a size equal to half the size of the bottle. There is a bottom plate for a base.

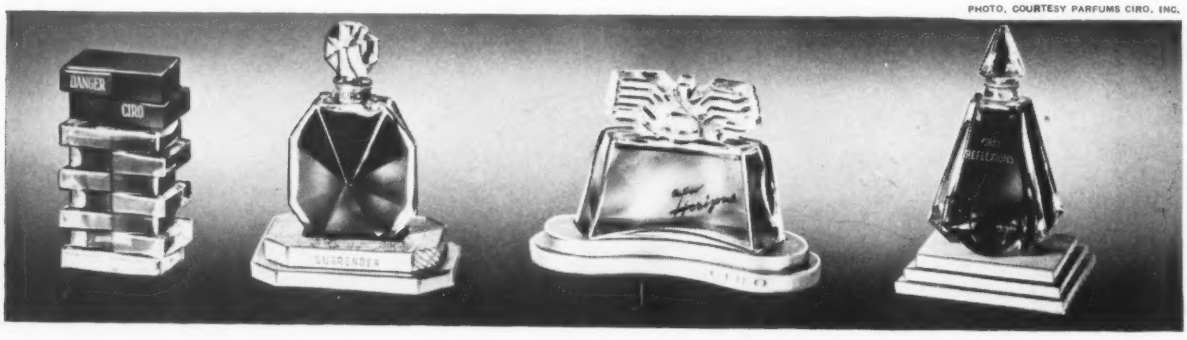
When the mold is closed around the glass, the blower sends sufficient wind through the pipe to spread the glass evenly against the walls of the cavities, forming the bottle. The mold is opened immediately and the bottle is taken out with pincers and then weighed. The necks of the bottles are then reheated and tooled to form a proper finish.

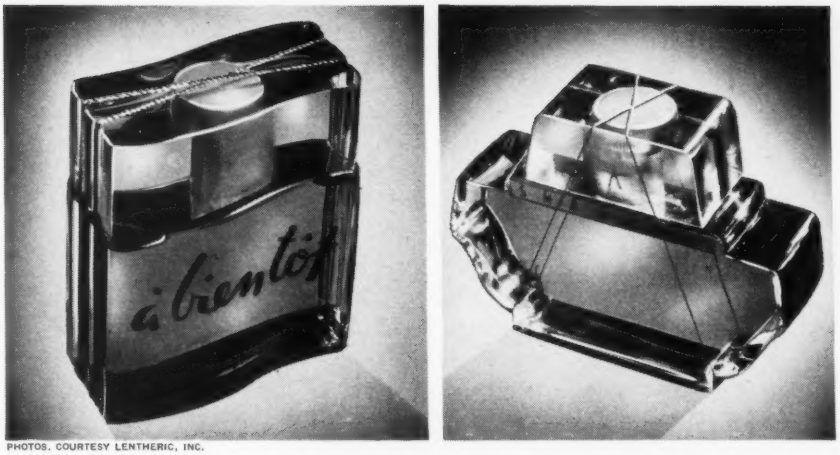
If the bottles are allowed to cool rapidly, they become extremely brittle and break from the least vibration. Therefore, they are placed in slow-moving lehrs that cool them gradually, and thus assure the proper temper in the finished product.

The bottles which pass inspection have their stoppers ground-in and tied to the necks to ensure against the possibility of interchanging, which would cause leakage and evaporation of contents.

1—Identification of individual scents as well as decorative value may be achieved by imaginative design.

PHOTO, COURTESY PARFUMS CIRO, INC.





PHOTOS, COURTESY LENTHERIC, INC.

2—The modern perfume bottle has sufficient beauty to be proudly displayed as an added accessory to the most glamourous dressing table. These containers demonstrate the unusual designs which have been effected by intricate hand work.

While the process which we have outlined is basic, it is susceptible to virtually infinite variations to meet the highly specialized requirements of a range of container designs.

Glass for hand-blown bottles is usually made of very carefully selected and blended materials fused in small batches in covered pots free from the impurities of factory air. Extremely delicate and sparkling effects can be achieved because of the high quality of the glass utilized, as well as because of the interesting effects in design attainable by hand-blowing operations when they are performed by craftsmen who are highly experienced in their work.

The difference in cost between containers made from stock molds and from private molds is markedly less in the case of hand-blown bottles than it is in the case of bottles made by machine. Since only one mold is used by each blower, and since hand-blown bottles are produced in relatively short runs, the cost of molds for private-mold bottles is generally lower when they are made by hand. This factor alone, however, would seldom be sufficient to swing the decision in favor of one type or the other.



PHOTO, COURTESY KIMBLE GLASS CO.

3—Many unusual effects may be attained by hand molding. This glass bottle is pentagonal in shape.

PHOTO, COURTESY GLASS INDUSTRIES, INC.



4—Some essences are offered in a variety of miniature hand-blown glass containers. The interchangeable stopper applicators are made of molded plastic, screw-threaded and then sealed with a rubber ring.

XUM

Tumblers as packages

by Frasier Smith

With the removal of wartime restrictions, indications are that tumblers, pressed or blown, simple or ornate, plain or decorated, will again take a prominent place in the packaging picture. There are few products for which tumblers are unsuited. They have been used successfully to merchandise such diverse products as processed cheese, cottage cheese, jelly, jam, peanut butter, salad dressing, horse-radish, soup mix, cocoa, tea, chipped beef, shrimp, pickled herring, cranberry sauce and caviar.

Many attractive designs in a wide range of capacities will be available in stock molds, and private molds of individual design will be available where the quantity used justifies the added mold cost. Blown tumblers, generally speaking, offer a wider choice of ornament and are lighter in weight. Pressed tumblers offer more uniform distribution, finished dimensions which are less varied, and in addition, decoration which is more defined.

A number of efficient closures are available, both side and top seal, for either band or bead style finishes, packed with or without vacuum.

The tumbler's chief claim to packaging consideration, of course, lies in its adaptability to re-use. It may be re-used in two ways: firstly, there is the obvious employment of the empty container as a drinking glass; secondly, it may be used as a container for home-made jellies and jams. When used for jellies, either commercially or home packed, the container may act as a mold and the jelly may retain an attractive form when inverted on the jelly dish. In many cases, these tumblers may be so attractively designed as to make their use for these purposes acceptable to housewives of considerable discrimination who are interested in appearance as well as utility.

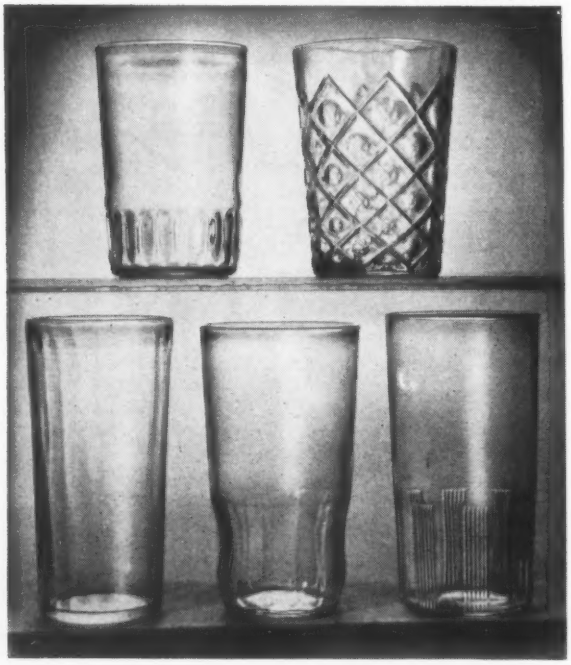
The application of intelligent, imaginative design, with due consideration for the nature of the product to be packed, may add much to the sales appeal of the package and to its subsequent acceptance as a piece of household equipment which can be used to satisfy many everyday needs.

There are two principal approaches to this merchandising problem. Variation in form and ornament may be incorporated into the molds, or decoration may be added in the form of applied color, usually fired on so as to become an integral part of the tumbler, unaffected by water, heat or ordinary wear. This color may cover the entire surface, or may be applied in a variety of patterns.

The obvious appeal of the re-use features will probably ensure for this type of container an increasingly important place in the postwar packaging picture.

Both pressed and blown tumblers (left), and those decorated means of applied color (right), offer the housewife a number of re-use possibilities, including the opportunity to collect a set of attractive glassware.

PHOTOS, COURTESY HAZEL-ATLAS GLASS CO.







1—Specialized glass containers, often made from machine-drawn glass tubing, serve for many pharmaceutical items. Typical examples are ampuls, serum vials and serum bottles.

PHOTOS 1, 2, 3, 4, 5 AND 8, COURTESY KIMBLE GLASS CO.

Specialized glass containers

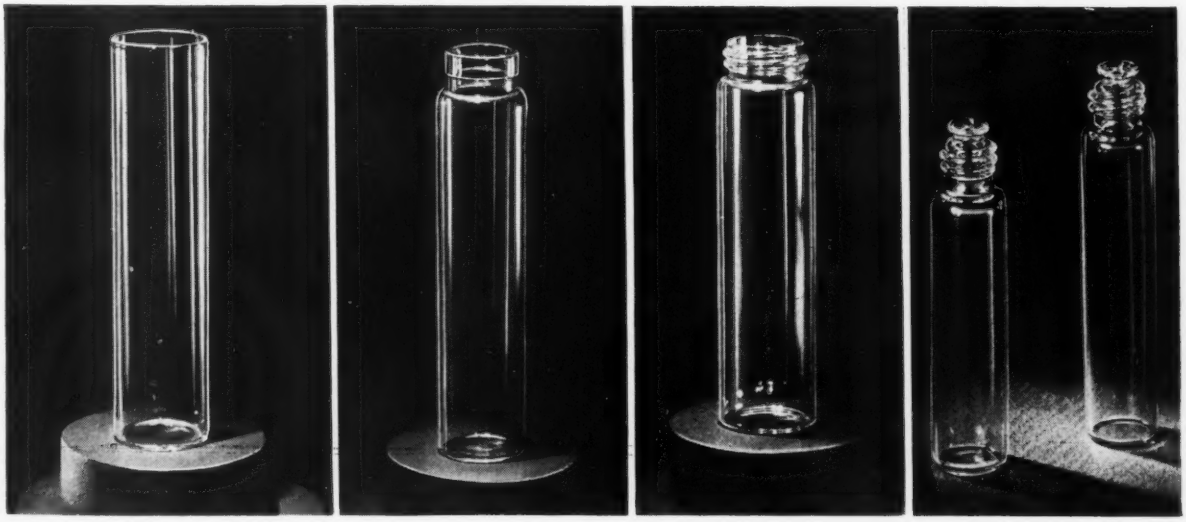
Specialized glass containers are widely varied in appearance and in application, and they include vials, ampuls, numerous bottles, etc. All of these containers fulfill a practical function, and many of them are decorative besides. Modern methods of fabrication have resulted in evenness of wall and freedom from distortion of vision without sacrificing strength in the containers made from machine-drawn glass tubing.

Glass vials are widely used for packaging liquids, powders and tablets when small, convenient and light containers are needed, as they are for many drugs.

Glass ampuls are accepted in pharmaceutical practice as the best, and often the only, practical means of providing utmost convenience combined with absolute sterility and protection over an indefinite period.

Standard types, such as those illustrated, are ordinarily available from manufacturers' stock. Special requirements, of which there are many, can usually be met with little difficulty or extra cost, as the machines used for fabricating these articles are remarkably adapt-

Glass vials: 2—(Left) Basic shell vial. 3—(Left, center) Patent-lip vial, used with cork or rubber closure. 4—(Right, center) Screw-cap vial used with screw closure. 5—(Right) Vials with constricted opening, screw finish.



XUM



6—Ampuls for penicillin: (Left) Bulb-shaped ampul for 25,000 units. (Right) Constricted-neck ampul.



PHOTO, COURTESY DECORATED CONTAINERS CO. AND HARRIS LABS.

7—Within the past few years it has been possible to print necessary information directly on glass.

able. Thus a considerable range of special sizes, designs and finishes is available on order.

The invention of the screw-cap dropper fitment, illustrated in Fig. 9 has caused the older type of stopper (used for bottles with a cork-finish) to be cast aside almost completely. The new fitment, or dropping part, which gives a perfect seal with the bottle consists of three parts: the squeezing portion or dropper bulb, the screw cap and the dropper glass.

The dropper bulbs and the screw caps are obtainable in all colors. The bulbs may be of natural rubber or of a special synthetic stock, the latter being recommended for use with oily preparations. This substance is also noted for its resistance to all climatic conditions.

The caps are designed to give a proper fit with the rubber or this special synthetic when assembled, and they incorporate convenience features for handling.

In addition to the three-part dropper cap mentioned above, dropper assemblies are produced in which the bulb and sealing portions are made of soft rubber and the screw or cap portion made from a harder rubber compound. Thus, bulb and cap are made as a unit and with the glass dropper inserted into the cap, form a two-part assembly. Natural or the newer synthetic rubbers are used.

The dropper glasses are precision made—the ball point style for the eye and the blunt style for the nose or ear. The U. S. P. dropper glass is recommended in cases where the number of drops delivered must be very accurate.

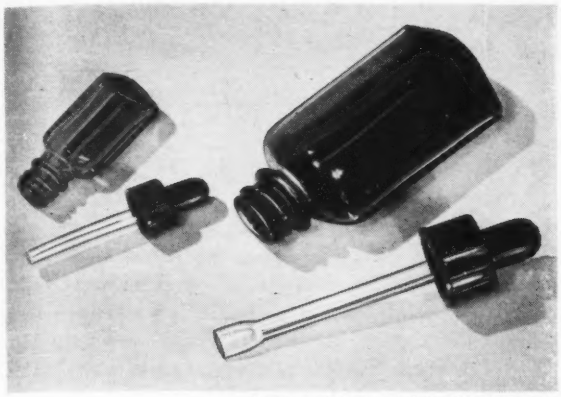
Vials can be made with flat or oval bodies, with round bottoms, open at both ends, with neck finishes modified to take a variety of closures. Ampuls of special styles, tolerances and sizes are often manufactured to order.

Glass vials and ampuls offer attractive possibilities in labeling. Metal or paper may be used, or the design and inscription may be printed directly on the glass itself. If permanency is desired, colored ground glass in suspension may be fused into the vial surface.

During recent years ampuls have been widely used, both for military and civilian purposes, for convenient distribution of small portions of drugs and other liquids.

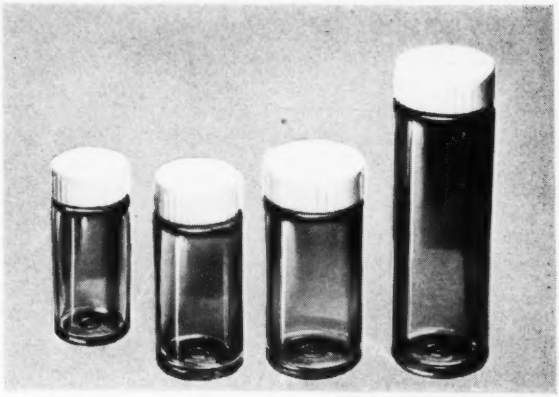


8—Many types of closure may be employed for vials, the choice of closure depending upon the degree of protection required and whether or not the container is to serve as a dispenser. Here closures are made of metal or molded plastic. A rubber dropper closure is used for vial in foreground.



PHOTO, COURTESY PENNSYLVANIA GLASS PRODUCTS CO.

9—A screw-cap dropper fitment produces a perfect seal. Bottle at the left has a spatula applicator.



PHOTO, COURTESY ARMSTRONG CORK CO.

10—Molded plastic closures are employed with these machine made amber glass containers for capsules.

A long vial of small diameter with a special finish makes an admirable iodine applicator. Vials and tubes with a closure at each end and a division in the middle have been developed to contain two different chemicals intended for mixing at the moment of use, as in photography. Sealed glass tubes make individual sterile containers for sutures and ligatures. Vials or small glass tubes are sometimes used as inner containers in more or less complicated assemblies. A simple and familiar example is the library-paste jar which utilizes a glass vial as a water and brush well.

The vials illustrated in Fig. 5 are appropriate for containing tincture of iodine, tincture of metaphen, tincture of merthiolate, Mercurochrome. They are especially valuable for use in the tropics. The special feature is the neck with screw thread finish, very constricted opening and relatively heavy lip. These vials are fitted with ordinary screw caps and when the cap is removed the vial itself serves as dispenser and applicator. Applicator vials were particularly adapted for use in the armed forces and are equally suitable for first aid kits or for home medicine cabinets in civilian life.

Blood plasma has been established as an essential in the medical profession. The armed forces required huge quantities, and hospitals and civil authorities are taking care to have sufficient supplies available.

Whether for military or civilian use, blood is collected from volunteer donors, and the plasma is prepared in the same way for both military and civilian needs. Bottles employed for collecting and processing human blood are illustrated in Figs. 1 and 11. Military authorities set up rigid standards for such containers during the war. Commercial firms supplying hospitals and other customers use containers made to their own specifications.

Penicillin, one of the newer and more widely publicized developments in the medical field, is an example of a vitally important drug requiring sterile packaging for multiple dosage. To meet the packaging specifications of this product, a bottle made of borosilicate glass with an aluminum seal has been adopted as the most suitable container.



11—A borosilicate glass jar forms the basis of this highly specialized package for dried human blood cells. The jar has a shaker top, dust cap and tear-tab outer cap. The closure is made of aluminum with rubber disk and rubber gasket.

Vacuum packing in glass

by H. C. Scott

Standard lightweight glass containers are so designed and constructed that they will neither collapse nor slowly lose their vacuum when they are hermetically sealed with an extremely high vacuum therein. Thus, the single vacuumizing operation followed by hermetic sealing guarantees a maximum protection against the harmful effects of oxidation and makes the additional step of adding an inert gas to the container unnecessary.

The three general methods of producing a vacuum in glass containers are:

1. Filling the container hot, hermetically sealing it and allowing the contents to cool. The contraction of the contents during cooling produces the vacuum in the jar.
2. Mechanical vacuum sealing, where mechanical means are used actually to withdraw the air from the container and leave a vacuum.
3. Steam vacuum sealing, where the air in the headspace of the container is displaced by steam, the subsequent condensation of which produces the vacuum.

Which of these methods is to be used by a given manufacturer will depend largely upon the nature of the product itself, the subsequent processing it is to receive after sealing, and the degree of vacuum desired in the sealed container.

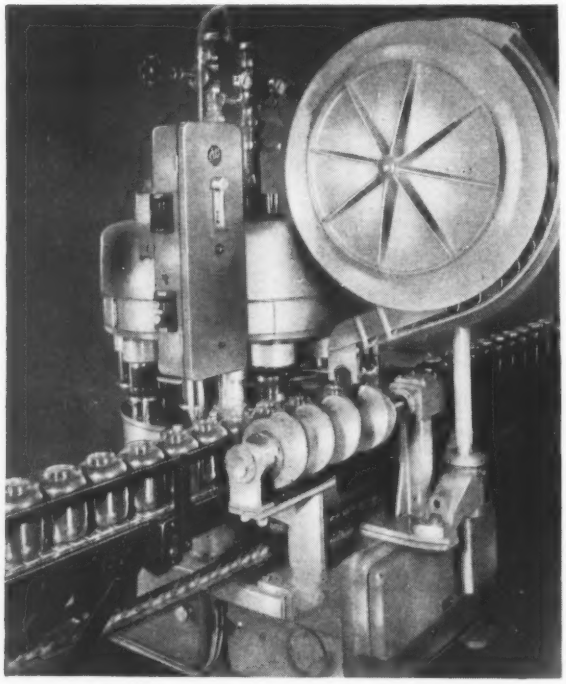
When the hot-fill procedure is used alone, it is necessary to fill the containers brim-full before sealing, in order to give the maximum protection against oxidation. Thus, it is seldom used with products packed in glass containers which are to be heat processed after sealing. Fruit juices, jams, jellies, catsup, chili sauce and pickle products are typical of the products which might be sealed using this method.

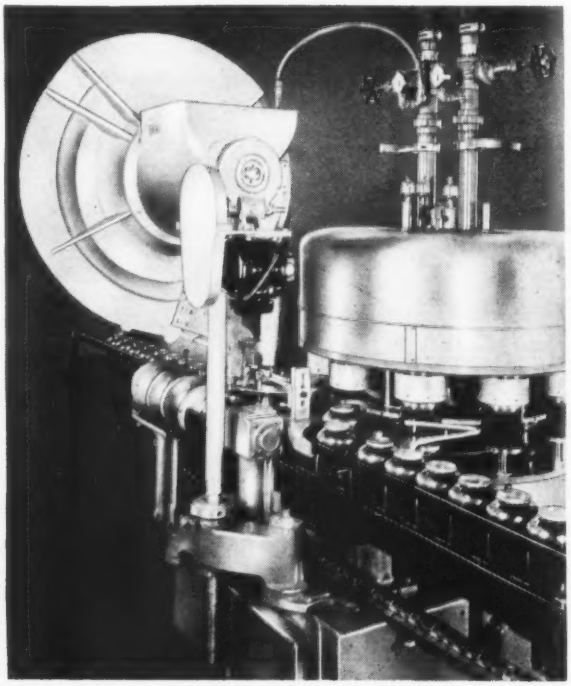
Mechanical vacuum sealing is applied to a large range of products packed in glass. For certain product types, such as coffee, salted nut meats, corn-on-the-cob and other items where considerable air is dispersed among the particles of the product itself, mechanical vacuum sealing is the only type of vacuum packing that can be used, since it is the only type which will remove the dispersed air throughout the container.

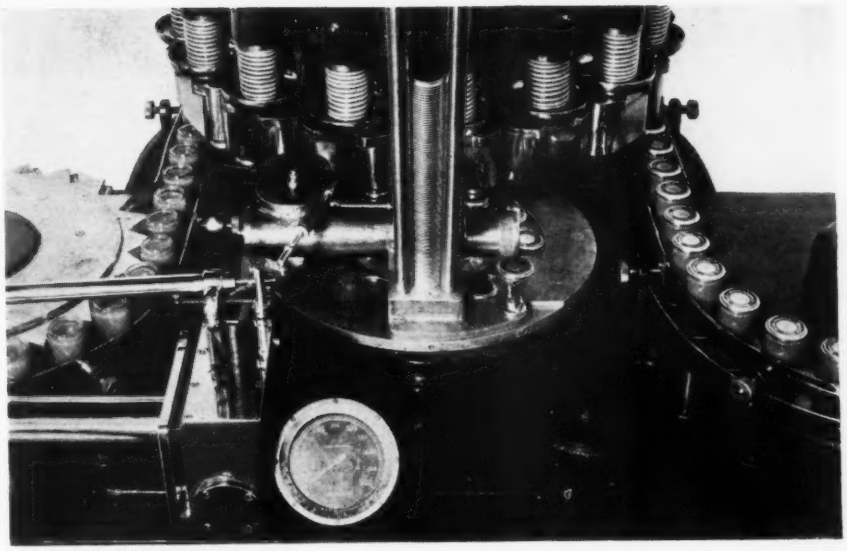
In mechanical vacuum sealing, two general types of machine are used. With one type of sealing equipment, jars are placed in a special chamber and the whole chamber is vacuumized. The container is hermetically sealed while the chamber is still under vacuum. With the other type of machine, the shoulder of the jar fits up into a special sealing head, the vacuum is drawn only

1—New coffee jar with resealing closure is vacuumized and capped, at 120 per min., on this 10-head rotary equipment. (Left) Caps fed from automatic hopper as jar enters vacuumizing head. (Right) Discharge of jars.

PHOTOS, COURTESY OWENS-ILLINOIS GLASS CO.







PHOTO, COURTESY ANCHOR HOCKING GLASS CORP.

2—Detail of 16-spindle rotary vacuum sealer designed for steam or mechanical vacuum application of caps to glass jars at 200–500 per minute. Here caps are automatically discharged into feeding star which then delivers them to the sealing heads of the unit.

on the filled container itself, and then the container is hermetically sealed while still under vacuum. If the particles of the product being vacuumized are very light in nature, as in the case of coffee, it is necessary to draw the vacuum slowly or by stages in order to prevent the contents of the container from being pulled out and over the sealing surface. However, with products such as whole kernel corn or nut meats, where the particle is relatively large or heavy, the vacuum can be drawn as rapidly as possible.

The third method, steam vacuum sealing, is the most widely used procedure for vacuum packing in glass containers. Although the great majority of foods which are vacuum packed in glass can be packed by either mechanical or steam vacuum, the steam vacuum method is usually chosen for reasons of production economy. The higher production speeds attainable, together with the simplicity of the sealing operation, have made steam vacuum preferable wherever a choice is possible. Virtually all glassed food products which are subsequently processed in retorts are sealed by the steam vacuum method. With these products, such as fruits, vegetables, meat products, baby foods, etc., the friction type of rubber-lined, side-seal closure is always used. Thus, the vacuum here serves a dual purpose of protecting the contents of the container from oxidation and helping to hold the closure in place both during processing and until it is removed by the ultimate consumer.

Today, many products which were formerly vacuum packed by the use of the hot-fill method alone are, in addition, sealed by a steam vacuum. By producing higher vacuums, this removal of any air which might have remained in the headspace of the container has eliminated the possibility of mold growth on the products so sealed. Thus, increasing quantities of jelly, catsup, juices, etc., are being packed by steam vacuum.

Formerly, the danger of adding moisture to the product prevented the use of steam vacuum sealing in many cases. However, the use of extremely dry steam has eliminated this objection and made it possible to pack by steam vacuum such products as peanut butter and others of a similar nature. Peanut butter formerly was vacuum packed by the mechanical method. However, the large percentages of air incorporated in the product itself limits the amount of vacuum which can be drawn. If too high a vacuum is drawn, the product itself is pulled from the container and a slack-filled package results, if indeed, sealing can be achieved at all.

The nature and character of some products adapt them exceptionally well to the steam vacuum method, but make it difficult to apply the mechanical vacuum method. Products that fall into this class are salad dressings, preserves and other hot-filled products.

A wide variety of closures can be used with vacuum-packed glass containers. In most instances, however, the type of vacuum sealing and the subsequent processing will determine the closure which is to be used.

With the use of the hot-fill method alone, virtually any type of hermetic seal can be used. This would include crown caps, rubber-lined screw caps, crimped-on, spun-on or friction-top and side-seal closures. The prime consideration here is the ability of the liner to make an hermetic seal and to maintain it successfully under any processing conditions.

Mechanically vacuumized products are usually sealed with paper-lined or rubber-lined screw caps, rubber-lined crimped-on caps or the friction type of rubber-lined top-seal or side-seal caps. Here again, the lever must make an hermetic seal and must stand up under any subsequent processing.

With steam vacuum sealing, the only closures which are ever used are the rubber-lined side-seal and top-seal caps. These are friction closures and are not crimped on but are held in place by the vacuum in the container and the friction of the cap and the glass.

Further data concerning vacuum packing in glass appear in *Hermetic, Vacuum and Gas Packaging*, p. 48; *Capping and Sealing Equipment*, p. 721.

Handling glass on the production line

by P. J. Martersteck

Four thousand years ago, an excited market throng crowded about a Phoenician sea captain who carefully held aloft a wondrous object—a transparent urn. An over-eager spectator jostled the captain, the urn slipped from his grasp and splintered into a thousand fragments.

For more than 3900 years thereafter, glass was handled reverently. Rapid temperature changes, extremes of heat and cold and physical shock were anathema. There evolved a connotation for glass which included words such as "fragile, delicate, crystal-like," the similes "shattered like glass," "brittle as glass," etc. Then machine production of glass containers expanded the supply so rapidly that it became urgently necessary to overcome these popular conceptions. A "glass peddler" pulled up his horse at a general store, opened the door and startled the gossips around the cracker barrel by throwing on the floor a glass bottle which not only did not break but actually bounced and remained intact.

The glass industry continued through the periods of public disbelief, doubt and hesitancy and finally arrived at the point today where people casually accept safety-glass, glass ovenware, glass cloth and glass containers of remarkable strength and uniformity. Such containers are slammed on a conveyor, unloaded, sterilized, filled, sealed and loaded, all on machines which pay little respect to flaws and irregularities and at speeds which seem incredible. Then they are shipped thousands of miles with negligible risk of damage or breakage.

Each step, however, in the evolution of the present-day container was taken only after experimentation in formulas, furnace construction, tempering, mold shapes, etc.

Each advancement in this field was met with new demands from the consumers and new developments by competing industries. Durability was increased, uniformity stressed, designs improved and costs reduced. Advancements in other types of container kept pace with those in the glass industry until the remaining major obstacle, excess dead weight, was overcome by the new featherweight containers. Just as airplane pay loads have been increased so has the payload of new glass containers.

Excessive demands on the industry in wartime were met by forcing furnaces far beyond their design performance, by running of complicated machines at new high speeds, precision scheduling of runs with a minimum of down time for mold changes.

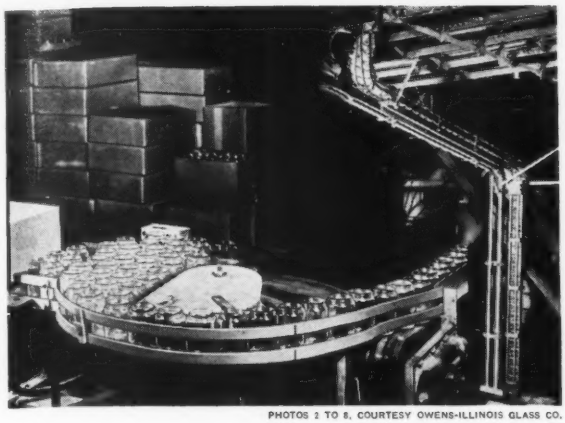
New markets clamored for containers for coffee, shortenings, fruits, vegetables, paints, etc. Each new call was met by increased production. Each new market presented new problems in the manufacturer's plant and new customers to be educated in the proper handling of these containers.

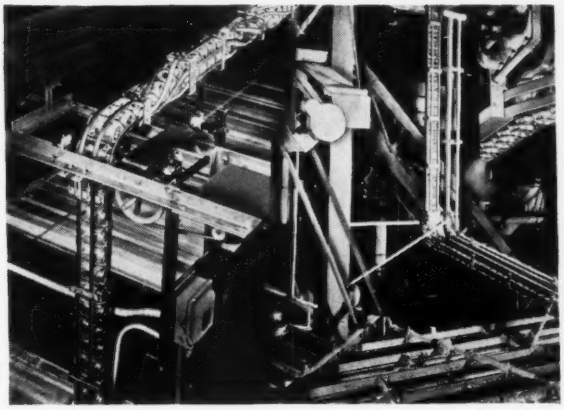
To enter a field formerly dominated by competing containers required that the glass manufacturers develop new packaging machinery in some cases and revamp existing machinery in others. It meant that the industry had to assist the users in developing new rapid sealing methods and fast handling procedures. That these demands were successfully met is obvious from the statements of new glass users that they intend to "stay in glass."

Through the range from gallon paint containers down



1—Typical of a well-conceived production line suitable for packaging in glass is this one in the Louisville Seagram plant. Each line has a capacity of 120 bottles per minute. Case sealers in the foreground are housed in streamlined covers which improve appearance.





PHOTOS 2 TO 8, COURTESY OWENS-ILLINOIS GLASS CO.

2—(Left) Unscrambling bottles before filling. Each product packaged in glass presents its own problems. Following illustrations are composite views of a typical line. 3—(Right) Conveyors move bottles between stations.

to minute penicillin vials, there are production problems to puzzle bottling superintendents. One user may stress durability, another consumer appearance and a third may demand extremely close capacity tolerances. While specifications are set up by glass producers to govern the many qualifications required, nevertheless some consumers need standards in excess of the manufacturers' specifications. It is obviously to the advantage of the glass manufacturer if he can meet these unusual demands since, in so doing, he raises his overall inspection standards and produces better containers for all his customers.

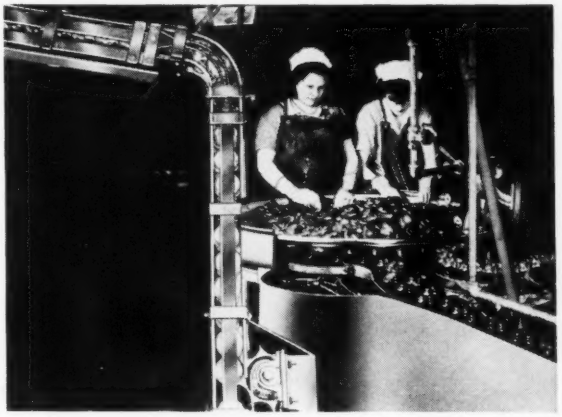
Specifications for glass containers

When the packaging problem at hand demands a container having closer tolerances than those set up as standard by the manufacturer, it is up to the consumer to draft his own specifications. In doing so, the first step is to list his requirements in detail in the order of their importance and to establish the required tolerances. The value of the tolerances can, in most cases, be carefully measured. Fill height, capacity, weight, deviation from perpendicular, percentage of rockers, visual defects—all can be evaluated from the standpoint of bottling efficiency, loss from breakage, losses due to overfill, etc.

Some glass manufacturers operate on closer tolerances than others. Therefore it is wise for a user to obtain the reactions of several potential suppliers before revamping his own specifications to suit those of one particular manufacturer.

Scheduling of glass

Never before was the proper placing of orders and scheduling of shipments so important. Manufacturers working on an extremely overloaded production program find it almost impossible to shift sizes or quantities, especially on short notice. Because there is a shortage, the movement of glass from the lehrs to trucks



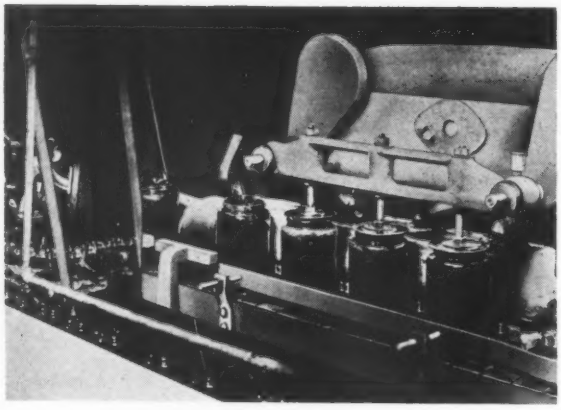
4—For filling glass containers, a combination of manual and automatic operations is frequently used.

or cars is a necessity. A smooth even flow of containers is not only of the utmost value to the consumer, but also assists the manufacturer in reducing his man hours per gross of bottles produced, thereby enabling him to decrease costs and increase output. Shipping schedules are often considered to be a minor factor in the operations of packaging plants. They should play a major role. Proper releasing from the supplier can eliminate two expensive items, demurrage and double handling in the consumer's plant.

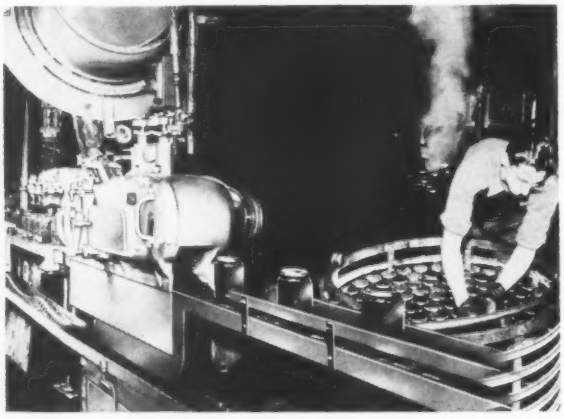
Shipping containers for glass

Three basic styles of shipping carton are used for transporting glass containers: the single-wall carton, the single-wall carton with inner liner and top and bottom pads, and the double-wall type. Interstate Commerce Commission regulations govern the selection in most instances. The most widely used are the single-wall carton with inner liners and pads, and the double-wall type. Carton specifications detailing requirements for weight and thickness of liners, type of corrugation, dimensions and printed matter are vital.

XUM



5—When fully automatic equipment is employed, the containers must be properly spaced at each step.



6—At the left, filled and sealed containers are shown at the discharge end of an automatic capper.

Carton requirements should be carefully appraised inasmuch as costs can be reduced, handling in the plant simplified and shipping losses reduced if adequate specifications are prepared. Excessive carton dust, for example, might hamper plant operations by making the cleaning of bottles difficult and might result occasionally in loss of goods being packed.

It is generally accepted that the use of die-cut partitions in lieu of sawed partitions will eliminate dust and provide a snug fit inside of the carton, thus providing for faster dumping at the packing line. Whether to use offset or straight scoring of cartons, whether to glue or stitch flaps, whether or not to use full height partitions in both directions—all of these factors must be carefully considered in order to provide the maximum in performance with a minimum of original and operating cost.

Food containers

The design of a food-processing plant requires that special attention be given to the excessive seasonal demands which will be imposed on that plant. Prime requisites for a food packing plant are generously estimated rail and truck sidings, sufficient docks, ample warehouse space for empty cases, durable pallet trucks, sturdy and accessible packaging machinery for quick repairs, sufficient space for by-passes in event of a prolonged breakdown of machinery.

Whether to transport cases on conveyors or on pallet trucks requires careful study. Conveyors offer the advantage of smooth, steady flow of materials with a minimum of handling. However, a breakdown in a conveyor line in a food plant could be disastrous whereas a breakdown of a pallet truck is a relatively minor matter.

The container design must be considered principally from the utility standpoint—sharp corners, flat panels and short-radius shoulders should be avoided. Low packaging costs are imperative while high machinery speeds plus thermal and physical shocks and the internal pressures encountered make it mandatory that the container be durable enough to withstand all of the handling to which it will be subjected, both during manufacture and in the hands of the retailer and the consumer.

Pharmaceutical containers

This industry is concerned particularly with the chemical stability of the glass and with capacity. A considerable percentage of the packaging of pharmaceuticals is done by hand, and therefore the containers are not subjected to the shocks encountered in many other lines.

The space layout of a pharmaceutical packaging plant should reflect due regard for new products which might require new lines. Facility in handling small lots of containers should be considered, as should requirements for isolated filling and sealing stations, for hygienic reasons.

Another factor to be considered is the danger of juxtaposing lines which handle materials similar in appearance, since improper fills might result. Abundant, well-directed light is also essential for the fine work required.

Cosmetic containers

Close attention to container design is required by cosmetics which are luxury items and highly competitive. Too often the sales department has full control over this phase of the business and, as a result, the bottling superintendent must labor with the fantastic shapes which may create consumer demand but increase packaging costs to an excessive degree.

While glass manufacturers may not prefer unusual shapes, they realize it is to their distinct advantage to work with their customers in creating attractive unusual packages.

Most cosmetic producers will find it decidedly helpful not only to consult with their bottling superintendents and purchasing departments, but also to insist that these departments confer with the container sup-

pliers in order to arrive at designs which will present the acme of attractiveness and utility.

The cosmetic industry recognizes the publicity value of a beautiful packaging plant, therefore close attention should be awarded the layout of machinery, the appearance of each unit and the aesthetics of the packaging floor. Reduction of noise levels and utilization of harmonious colors will culminate in higher efficiencies, improved employee morale and higher advertising value.

Bottling lines must be sufficiently flexible to permit rapid changes in container sizes and shapes. Perfect labeling is a prerequisite for high consumer appeal and bottle machinery designs should be selected with that in mind. Careful case loading must be watched and carton interiors should be smooth and well fitting to reduce scuffing in transit.

Beverage containers

Coffee, milk and beer all present similar problems in that large volume is dominant. This means rapid handling of containers. In these lines, too, the weights of the containers are being reduced. With the requisite high speeds, extreme care should be exercised to eliminate physical shock. Rubber-padded dump tables, plastic guide rails and star wheels, synchronized lines and mechanical loading diminish breakage. Careful engineering of conveyor systems minimizes jams which cause breakage. Proper use of friction-top belts and obtuse angles on inclined chutes control another source of trouble.

In the wines and liquors field, the bottler is confronted with the problems of handling distinctive designs, constant battles against breakage which is abnormally serious because of high taxes and the production of large volumes. The penalty for over-fill and breakage of filled containers is exorbitant, and volume is sufficiently high to warrant close control over production efficiency.

All available safety measures should be used to avoid the imposing of strains on the container before and after filling. Many useful devices are mentioned above, but in addition, there must be close inspection of empty containers in order to weed out undesirable lots.

Inspection of empty and filled containers

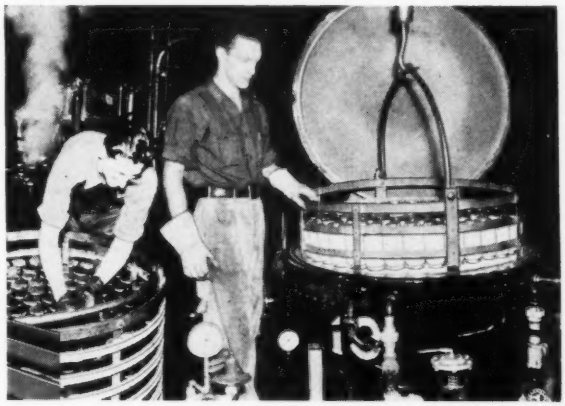
Inasmuch as the optimum in efficiency is desirable, any plant operating high-speed mechanical lines should have a quality inspection department which samples each shipment of glass and determines whether the glass conforms to the specifications agreed upon.

In addition, there should be an independent department for the control of quality. Such a department should be responsible to the plant manager, who judges finished packages from every consumer viewpoint: clarity and appearance of the product itself, the label, closure and bottle. The judges must be impartial and well trained.

They must have adequate rest periods or a system of rotation should be used to prevent these judges from going stale on the job. Although rigid standards for performance in the packer's plant may, at first glance, seem conducive to high costs, this is not true. Actual tests have proved that while the installation of high standards will momentarily reduce efficiency, costs will soon curve downward and efficiencies climb as each employee realizes that his work is subject to close, impartial appraisal.

Further data relevant to the handling of glass on the production line are given in articles in the *Machinery and Equipment* section of this volume, p. 699.

7—Strong and uniform, the modern glass container will survive many processing steps along the line.



8—Packing the finished product. Detailed specifications govern the selection of shipping containers.



XUM

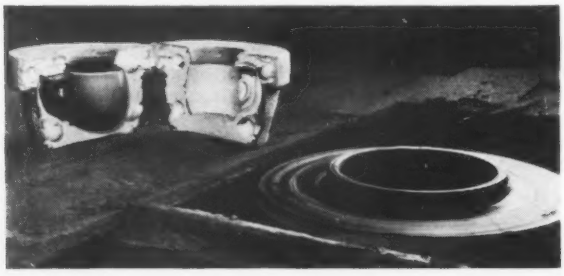
Pottery containers

The appeal of a pottery container is nostalgic. Almost alone in the packaging field it carries on the tradition of ancient hand craftsmanship into a world of high-speed mechanical production.

Methods of making pottery have been improved by tunnel kilns which decrease the firing time. Establishment of ceramics as a technical study in the engineering departments of a score or more of universities and colleges has enlarged the knowledge of chemical properties of clays and glazes and improved the protective qualities of pottery containers. Assembly line technique has enabled greater production to meet almost any packaging requirements.

Jiggering and casting have supplanted hand-throwing methods, but even today you can still see here and there in a modern plant, a potter making an object on a hand-throwing wheel. "We shouldn't be making things this way," the owner of a modern plant will say, "but on small orders, such as a few hundred pitchers, for a chemical firm, used for pouring acids, it's less expensive than making molds and jiggering the pitchers."

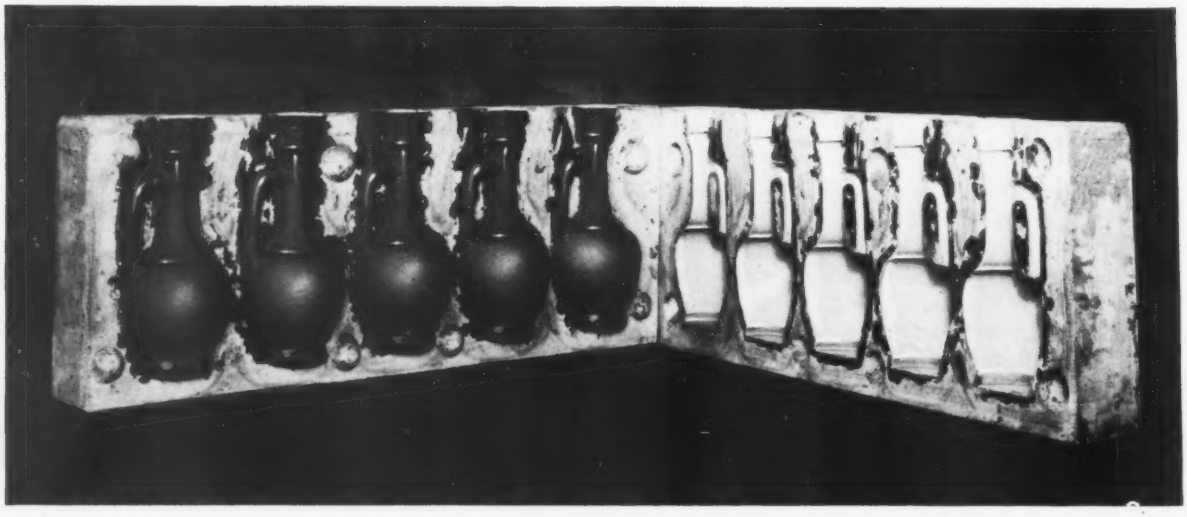
No matter what modern methods have been developed to increase production, there is still much handwork in making a pottery container.



Modern pottery plants are equipped to supply the packaging field with containers that have all the required protective and decorative features, but the user must be prepared to pay the price for the added eye appeal and special advantages of pottery.

One large producer of pottery containers cites an example that illustrates these economics. This firm has made more than two million pottery containers per year for a toiletries line during the past few years. These containers sell for about 10 cents apiece to the toiletries firm, which uses them as containers for a dollar item. The cosmetic house preferred the pottery containers for the merchandising advantage they gave the product and was even willing to stand additional overhead for applying closures by special semiautomatic methods. Only recently this firm, because of increasing production costs all along the line, decided to go into glass. The pottery company which supplies them had added considerable facilities to produce the quantities of containers required, but they are not sorry that the account has been taken away at existing prices. The same equipment used for making these small toiletries containers that sold for 10 cents apiece is now producing pottery vases for about $6 a dozen which retail at twice that sum. At the moment, this pottery firm is out of the packaging container business completely. They don't say they won't get into it again, but for the time being, their production facilities

1—(Left) Newly-formed mug made by "jiggering." Clay in split mold is placed on wheel where inside is shaped. 2—(Below) For casting, liquid or "slip" clay is poured into molds which are inverted when dry. Inside "slip" is then poured out to form cavity.



are being as profitably employed in other places.

This same condition does not maintain in other pottery firms, however. They are ready for new pottery container business and are only limited in what they can supply by a shortage of labor. Basic materials—clay and glazes—are plentiful.

These companies are equipped to produce containers suitable for a long list of products—foods, spices, cosmetics, cheeses, liqueurs, wines, honey, maple syrup, jams, marmalades and condiments. They also make a wide range of stoneware for laboratories, equipment manufacturers and the process industry.

Pottery is essential for certain chemicals. Such containers look like old-fashioned vinegar jugs. Mercury and iodine resublimed, for example, have been packed in earthenware containers for years.

From a consumer packaging standpoint, the eye appeal and the re-use features of a pottery container are its greatest merchandising assets. Because of the nature of production, shapes follow classical lines which have grace and pleasing symmetry. Pottery containers do not have the uniformity characteristic of other types of container and greater variations must be expected in dimensions and capacities. This very irregularity, however, provides the handmade look so desirable in a specialty or gift container. Cost in relation to selling price of product varies greatly with the market for which the products are planned. If the pottery is used primarily for the added eye appeal on a gift item, the user can afford to allow a little more for a pottery container. On the other hand there are cheese jars of a purely functional nature which compare favorably in price with any other type of cheese container.

Each user's requirements must be studied individually to determine costs, colors, design and quantities that can be supplied. The makers of pottery containers will tell you whether or not your product can be profitably packaged in pottery and will advise the type of container that is suitable. Oftentimes a user will desire a container that is entirely impractical from a production standpoint or will want color and applied decorations that will raise the cost unreasonably.

Modern pottery for containers is made by two methods: *Jiggering*—With this method, the clay in plastic form is placed in split molds. The filled mold is then placed on a power-driven "jigger" wheel which runs at the rate of about 200 r.p.m. A tool or "foot" fits down into the inside of the mold and shapes the inside of the container as the wheel turns. The molds are made of plaster of Paris which absorbs moisture from the clay. The mold with the formed container in it is removed from the jigger wheel and allowed to dry a certain length of time until the formed object shrinks sufficiently from the mold to be removed. Mold marks must then be removed from each container by washing with a moist sponge. Each container must be handled separately in this manner. Then it is placed in a drying rack and taken to the drying room. After the glaze and decoration are applied, it is ready for firing.

Casting—Cast pottery containers are made from liquid or "slip" clay which is poured into the molds. The molds are left a certain length of time until only sufficient drying has taken place so that when the molds are turned upside down the inside "slip" may be poured out to form the cavity of the container. This requires long practice by skilled workmen to determine just how long to let the slip set to get the required thickness, uniformity and capacity for the container. After further drying the container may be removed from the mold and mold marks removed by sponging. From this point, procedure is the same as for jiggered objects.

3—Pottery containers are especially adaptable for men's toiletry lines. House of Croydon makes effective use of cast jugs and jiggered mugs for shaving.



4—Small jugs for packaging cooking and barbecue sauces are decorated by applied design in colors.



5—Products like maple sirup and honey can go right to the table packaged in attractive, colorful jugs with sturdy handles and pouring spouts.



XUM



6—Shulton Old Spice containers for men illustrate use of colored design stamped on container and fired right into the piece.

By means of casting it is possible to obtain greater variety of shapes, particularly square-type bases which cannot be produced on the "jigger" wheel.

Production of one jigger wheel or of one caster may run from 500 to 1500 pieces, depending upon the shape and size. Total production may be any number of pieces depending on the amount of equipment a plant has. Most small-mouthed pottery containers are made by the casting method. Sometimes, however, they have been jiggered in two sections—top and bottom half—then fitted together. This is not always so successful, since the seaming may not provide as tight a container and may cause leakers.

The basic color of a container depends on the locality from which the clay is derived, on the composition of the body and the method of firing. Bright color effects are obtained by glazes. These may be transparent glazes or opaque glazes which are known in the trade as "mat" glazes. Glazes also give containers added moisture protection. Color possibilities are determined by the degree of temperature at which the glazes may be fired. Certain brilliant colors cannot be maintained



7—(Left) Unusual private molds may be obtained in many shapes if they conform to the manufacturing processes. 8—(Right) Square-type containers can be made only by casting.

under high temperature firing. That is why, if you require an extremely vitreous, moistureproof container, you may have to select one with less vivid coloring.

Clay tends to be porous. Usually the higher it can be fired the more vitreous it becomes, and thus a moistureproof or "tight" container is produced. The firing a clay will stand depends to a large extent on the composition of the clay. Good clays are found in too many parts of the United States to be enumerated. Firing up to 2300 deg. F. usually assures a "tight" container. Clays are tested by staff chemists to determine what degree of firing they will endure. Above a certain temperature, they are apt to melt and the container cannot hold its shape in the firing process.

Added color and decorative effects are obtained by a series of applied glazes and firings, but such added treatment adds to the cost of a container. Pictorial or trade-mark design is often provided by rubber stamping the design on the body before glazing. Such designs are thus fired right into the piece. Decorative effects are also obtained by producing the form of a flower or bird in the mold. Further effect may be obtained by covering this "embossed" pattern on the clay body with additional colors which are fired on.

For many packaging purposes, however, trade designs are put on by means of decalcomania after the containers are finished. This is a less expensive method and may be done by companies who specialize in this feature. Labels of paper or other materials also may be affixed and are the least expensive of any type.

Closures for pottery containers include pottery lids and stoppers affixed with various types of adhesive tapes, patented metal-clamp lids, corks alone or combined with plastic, wood or metal.

Overseals of viscose have been found to be essential in many cases and are good assurance against leakers.



9—Like a number of other specialty items, cordials and liqueurs can be effectively packaged in pottery.

The lack of uniformity in the mouths of pottery containers, due to the inherent characteristics of manufacture, makes secondary closure protection worthy of careful study to get best results from the use of pottery for liquid products or for those products which are subject to evaporation.

There is sometimes confusion in the terminology of pottery. In general, the word "pottery," derived from the French *poterie*, designates all objects made from clay. Some authorities classify earthenware and stoneware as terms that may be used almost interchangeably. Usually these two designate the heavier type of ware of less brilliant coloring, but of good vitreous quality. Sometimes these terms are applied to wares made from



10—The manufacturers of Seaforth men's toiletries have been leaders in the use of pottery for packaging.



11—Though basically similar in design, these two pottery containers represent a range of capacities. The jug for chemicals on the left holds 25 lb.; the cheese jug on the right contains 1 lb., 6 ounces.

native local clay without "imports." In this case "import" means any clay foreign to the immediate vicinity where a pottery is located. Porcelain is usually confined to well-marked varieties of pottery that have a translucent quality. "Ceramics" is derived from the Greek word, *keramos*, meaning potter's clay and is the general term applied to the study of the art of pottery.

The modern manufacturer of pottery containers, encouraged by the demand for such packaging, has developed means of supplying requirements for a wide variety of applications at a price that is feasible for each particular use. He is ready to serve both large and small customers at prices that are well within reach for each purpose. As the labor situation improves he will be able to supply the quantities required. He is also in a good position to supply the small user with a number of stock molds which may be given distinctive colors with the right glazes and may be attractively dressed up with labels or decals to give them individuality. These molds offer effective packaging mediums, particularly for small industries in the specialty field. Home-made food products are being given great impetus in many parts of the country. New York State, for example, is now conducting a campaign to help women get started in small businesses and is assisting them with ideas for packaging in pottery.

Special molds may be designed for large customers and the pottery manufacturer will give you the information you need about quantities for which a private mold is feasible.

Release of many industries from war work is putting them in a position to look for specialized fields of merchandising. The pottery container can provide an interesting sales tool for such projects.



12—Here again, a range of pottery uses and sizes is shown. The small jug at the left is dressed up to serve as a decorative cosmetic container. At the right is an unadorned 5 lb. jug used for chemical products.

ADVERTISING FOR GLASS— CLOSURES— POTTERY

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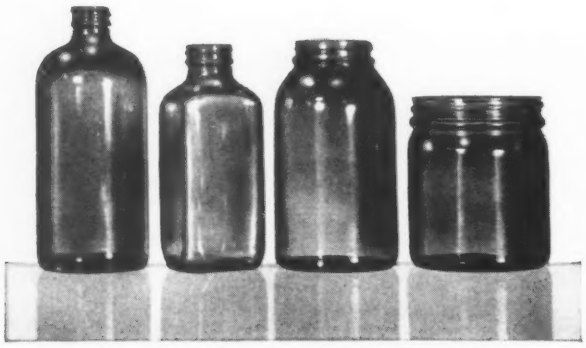
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Anchor CONTAINERS

All standard styles, capacities of wide mouth and narrow neck jars, bottles, and jugs in crystal and amber glass. For foods, drugs, medicinals, chemicals, household and industrial products, cosmetics, perfumes, toiletries, liquors, wines, beers, and beverages. Includes new, featherweight One-Way Beer Bottle!



● Anchorglass Food Containers



● Anchorglass Drug and Chemical Containers



● Anchorglass Liquor Bottles



● Anchorglass Wine Bottles



● Anchorglass Beer Bottles

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Hocking

Tune In ANCHOR HOCKING'S HOBBY LOBBY CBS NETWORK . . . THURS. EVE.

CLOSURES

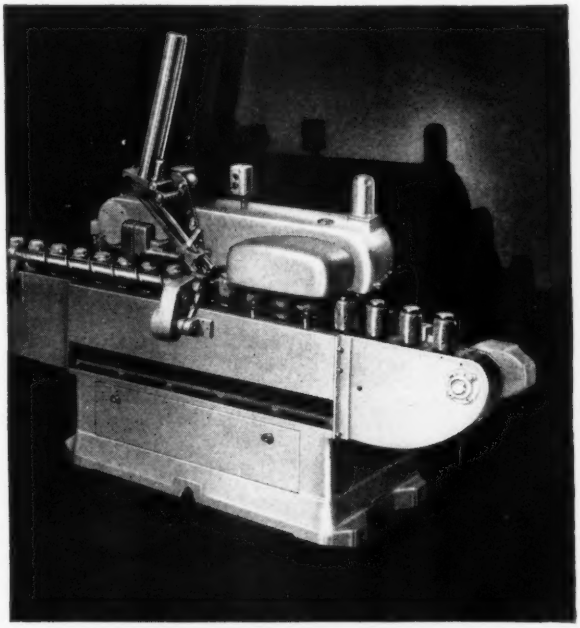
Complete line for use with every type of glass-packed product—hot or cold packed, with vacuum or without, sterilized or processed. Of Anchor Hocking's 14 types of metal and molded closures, there's one that's right for your job.

SEALING MACHINES

Hand, foot, semi-automatic and full automatic sealing machines for applying friction type Anchor Caps. Includes new Anchor Steriseal Machine for high production steam vacuum sealing with AH-N Caps, and the new Anchor 16 Spindle Rotary Sealing Machine capable of vacuum sealing 200 to 500 packages per minute.



● Anchor Metal and Molded Closures



● Anchor Steriseal—the first major postwar packaging improvement!

HERE, in one reliable, responsible source, is the answer to your complete packaging problem.

Want a specific container or closure? Anchor Hocking has it!

Need overall package recommendations for more sales, more satisfied customers? Anchor Hocking Merchandising Service is at your call.

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CONTAINERS AND CAPS

PRODUCTS OF
ANCHOR HOCKING GLASS CORPORATION
LANCASTER, OHIO

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KIMBLE VIALS



for Greatest Transparency . . Least Distortion

This unretouched photograph of a Kimble vial, fabricated from machine-drawn Kimble glass tubing, tells its own story of how clearly this attractive type of container would display your product.

For Assurance

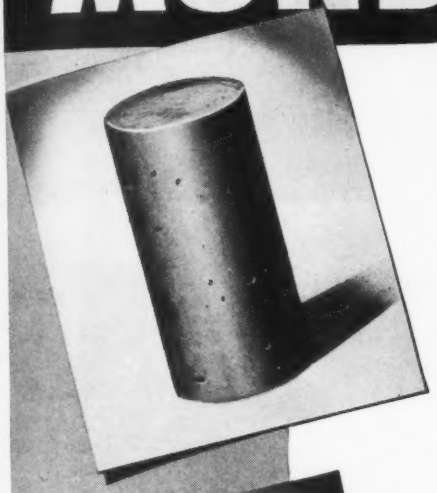
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MUNDET CORKS





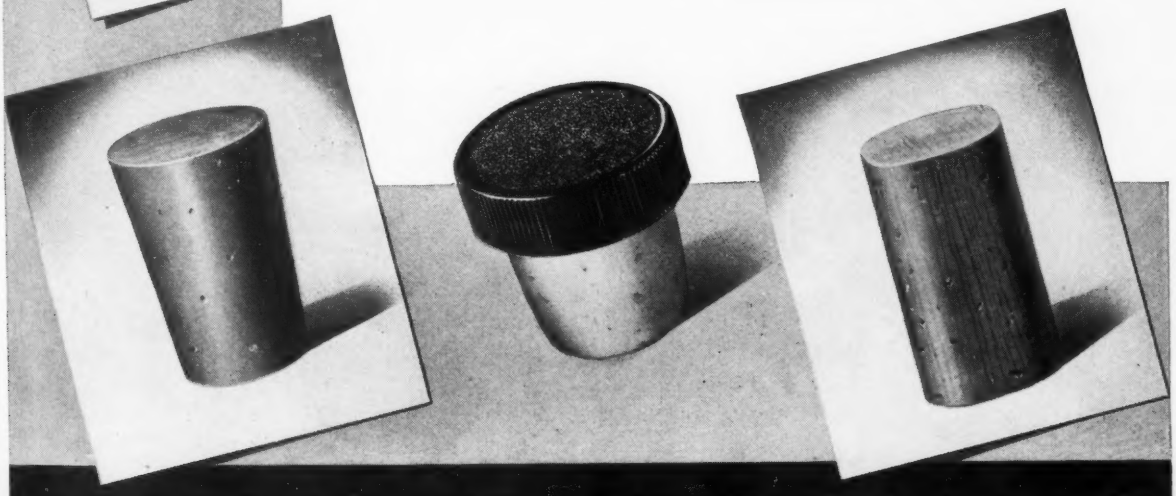
QUALITY varies in Cork, as it does in other raw materials. The cork oak's production is affected by climate; by method and frequency of stripping; by the age of the tree. This affects your bottle sealing for better or worse.

We've specialized with cork for 80 years. We know cork in all its many grades. We've kept our own representatives in areas where the world's finest commercial cork is grown—to be sure of getting the best of each year's yield. And we've redesigned and improved cork manufacturing equipment on the basis of what we have learned about bottle sealing. Your products benefit from this experience and from Mundet's determination to give you the best possible closure service. You *safe-seal* your bottles when you use Mundet Corks and Closures. Mundet Cork Corporation, Closure Division, 65 S. Eleventh Street, Brooklyn, N. Y.

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ATLANTA	DALLAS 1	JACKSONVILLE 7, FLA.	NEW ORLEANS 16
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MUNDET CLOSURES

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CROWN

CLOSURE users, large and small, find it pays to deal with a qualified specialist in this line. That's why you find Crown Closures on so many of America's best known brands of food, cosmetic, drug and household products packaged in glass.

SCREW CAPS



The only screw caps that have the patented Crown Deep Hook Thread. This patented cap thread hooks *under* the glass thread of the container without side scraping or wedging. Result—caps seal tighter, are easier to apply and easier to remove.

This Crown improvement in screw caps established a new high standard of sealing efficiency in the food, drug and cosmetic industries . . . a standard which others have since been trying to equal.

VENT CAPS



A Crown innovation which has solved many a troublesome problem for packers of products that generate gas. These caps have a patented liner which vents at comparatively low pressure during the shelf life of the product, thereby reducing the possibility of any liquid being "blown" upon the customer when the container is first opened.

BOTTLE CAPS



Originated and perfected by Crown, these caps for years have been the standard closure for carbonated beverages, beer and ale. They are also an efficient seal for many other kinds of liquids. It's significant that more Crown Bottle Caps are used by soft drink bottlers and brewers than any other kind.

CLOSURES

LUG CAPS



Made to Crown's established high standards of accuracy and uniformity. Beautiful decorations and efficient liners in wide variety make Crown Lug Caps popular for many kinds of foods and other products packed in glass.

VPO CAPS



A one-piece vacuum closure that utilizes the "top sealing" principle in connection with a special glass finish. The special rubber ring liner used in VPO Caps assures the perfect vacuum sealing of every container.



SLIP RUBBER RING

Another Crown "exclusive" that adds to the efficiency of Crown Closures. These patented rings are impregnated with a specially developed lubricant which works to the surface under pressure and prevents the rubber from sticking to the jar. Available in Lug, C.T. and Mason Caps.

CROWN'S facilities, experience and reputation assure you of satisfactory closures and a dependable source of supply.



FACTORIES AT: BALTIMORE, ST. LOUIS, SAN FRANCISCO, LOS ANGELES

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WORLD'S LARGEST MAKERS OF METAL CLOSURES

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Diversification



No. 1
Non-Rolling extra depth bakelite cap; thick flange rubber part; Saftee ball glass. Recommended for the eye.

No. 2
Metal cap; special thin flange rubber part; U.S.P. glass for medicines of high potency.

No. 3
Regular depth bakelite cap; synthetic rubber part; semi-blunt glass. Used for general purposes.

No. 4
Single shell metal cap; Amekine synthetic rubber part; blunt glass. For the nose or ear.

No. 5
Fancy Durex cap; midget rubber part regular straight glass. Used for general purposes.



Improved new shape bottle, lies flat on its back, for greater ease in labeling. Front shaped to afford largest possible label space.

New Perfection Dropping Parts are highly diversified. The wide range of their use in the packaging field bears testimony to this. A few of the styles are shown here.

Bottles can be supplied for use with the dropping parts illustrated. They come in amber, blue, green, or clear glass in the new modernistic style in sizes 2 cc, 1/8, 1/4, 1/2, 1, and 2 oz. capacity. Amekine synthetic rubber bulbs are recommended for use with oil preparations, such as nose and ear drops and vitamin preparations. Amekine is the most resistant stock known for use with oil as it does not swell like other rubber after being exposed to oil over a long period.

GLASS GOODS OF THE BETTER KIND

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PENNSYLVANIA GLASS PRODUCTS CO.

428-432 North Craig Street
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Profit from Preference with



packages that protect
AND sell

GLASS PACKAGES

A nation-wide survey recently established these emphatic odds for Glass Containers for foods and household products. And the preference is growing . . . growing into the biggest sales *plus* you can give your brand! Here are the 4 big reasons why women prefer your product in glass: **VISIBILITY, PROTECTION, CONVENIENCE, ATTRACTIVENESS.**

BABY FOOD, 3 to 1
"Glass is sanitary—adds no taste of its own!"

PEACHES, 2 to 1
"Left-overs can be stored in original container!"

COFFEE, 2 to 1
"Caps come off easily—re-seal tightly between uses!"

CLEANING FLUID, 3 to 2
"Glass shows contents—tells when to buy more!"

GLASS SELLS FASTER — REQUIRES LESS SELLING TIME

In a 1945 National survey of retailers the 50 per cent who attributed a selling time factor to the package itself voted 3 to 1 for glass.

APPEARANCE:
Customers see what they want — and want what they see. Glass offers each product in its own crystal-clear show-case — a constant invitation to buy!

DISPLAY:
Gleaming glass containers and their colorful contents dress up a store as no other container does. They attract.

SALES:
The biggest sales plus for retailers — their customers prefer glass containers! Products in glass require less selling time!

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PREFERRED BY WOMEN...

It's the greatest sales advantage in the world!

PEARS, 5 to 2
"You can see the quality of what you are buying!"

SALAD OILS, 4 to 1
"Glass containers can be used on the table!"

BEETS, 5 to 2
"Garden-fresh flavor is carried straight to the table!"

FURNITURE POLISH, 3 to 1
"Container doesn't corrode —is easily wiped off!"

FRUIT SALAD OR COCKTAIL, 2 to 1
"You can see size, quality, variety!"

FOOD BEVERAGES, 5 to 1
"Keep better, fresher in glass!"

Duraglas containers have all the advantages of glass, plus customer service through an extensive research program and unexcelled production facilities that assure dependability of supply.

Investigate Duraglas Containers before you tie up your capital in a packing line that does not give you all the advantages of glass.



Duraglas
TRADE MARK REG U S PAT OFF
CONTAINERS
lead the way
to new profits!

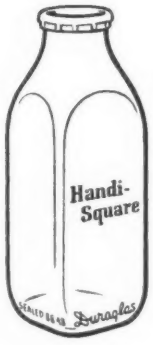
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NEW Duraglas CONTAINERS
establishing new preferences!



"1-WAY"
BEER BOTTLE

In Utica, New York, where no deposit—no return bottles and other non-returnable beer containers have been used, there were 9 votes for the one-trip bottle for every one vote for the next most popular one-trip container.



HANDI-SQUARE
MILK BOTTLE

9 out of 10 housewives vote for new easy-to-handle, space-saving Handi-Squares! A big distributor advantage: 3 cases of Handi-Squares take up same space as 2 cases of round bottles.

In the course of 1946, these new Duraglas Containers will be available in sufficient quantities to start filling the overwhelming demands!

OTHER FAMOUS DURAGLAS CONTAINERS:

Complete lines of Beer Containers; Dairy Containers; Cosmetic Containers; Emerald Green Prescription Containers; Flint, Georgia Green, Amber Beverage, Wine and Spirits Bottles . . . Closures, Cases. A complete glass packaging service!

In Owens-Illinois Laboratories,

many of the glass packaging improvements of recent years have been initiated.

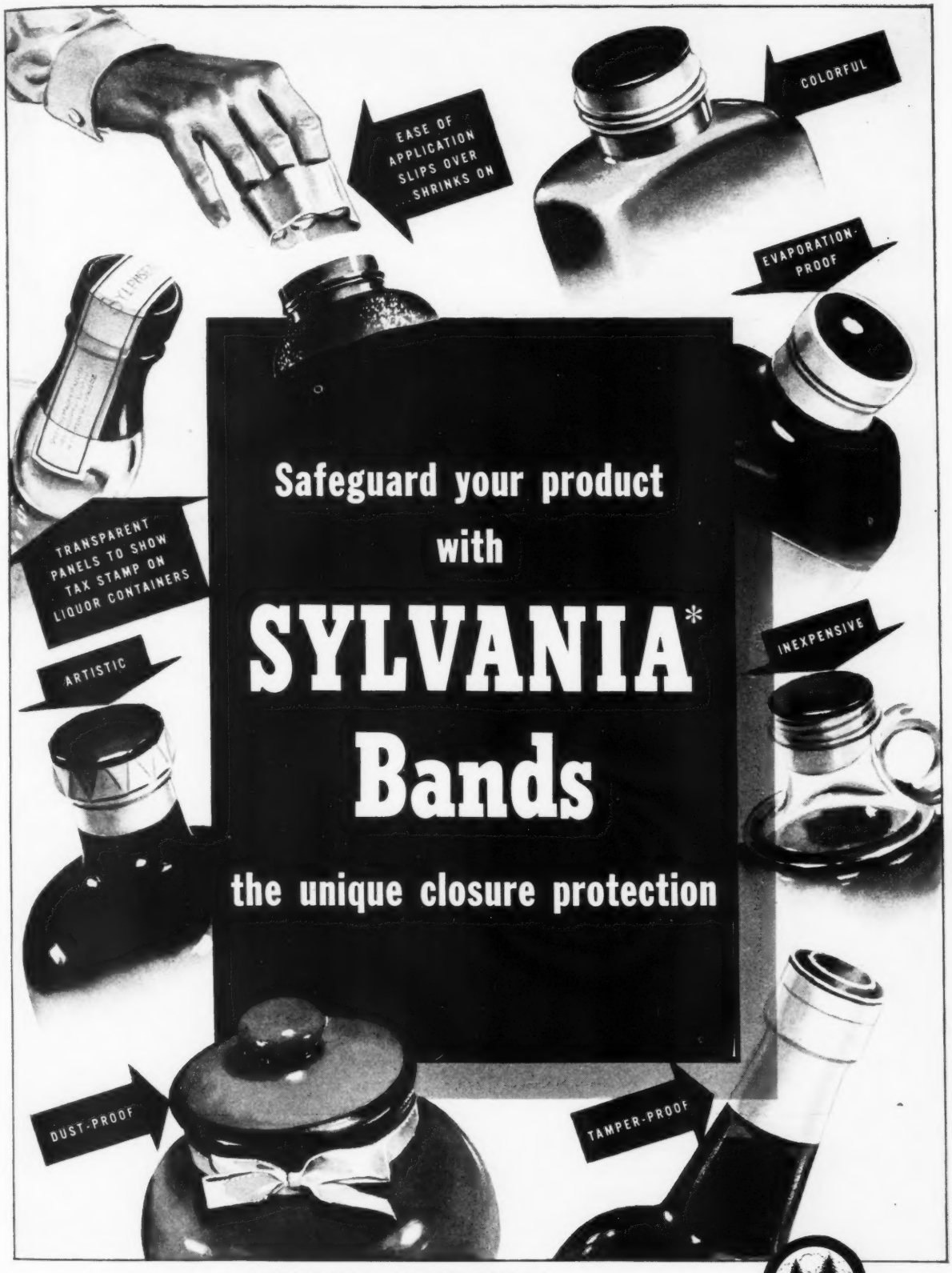
In Owens-Illinois Research Departments,

surveys and studies are constantly investigating significant home-making trends and purchasing preferences in order that users of Duraglas Containers may profit from this "know-how" most constructively.

We invite consultation on any packaging problem you may have "from your production line to the consumer's mind."



OWENS-ILLINOIS
GLASS COMPANY
TOLEDO 1, OHIO
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Made only by SYLVANIA INDUSTRIAL Corporation

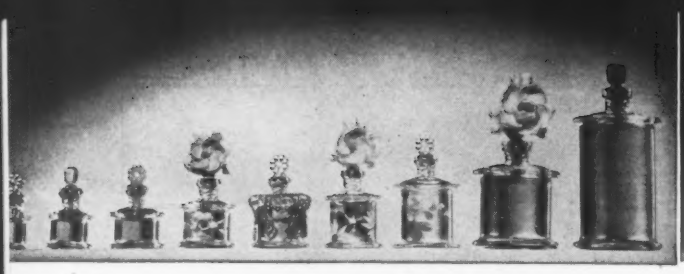
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General Sales Office: 122 E. 42nd St., New York 17, N. Y. ★ *Plant and Principal Office:* Fredericksburg, Va.

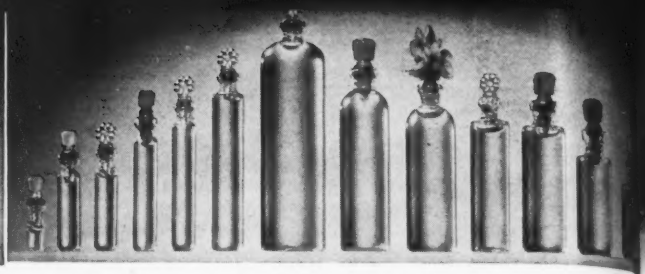
SYLVANIA CELLOPHANE

*Reg. Trade Mark

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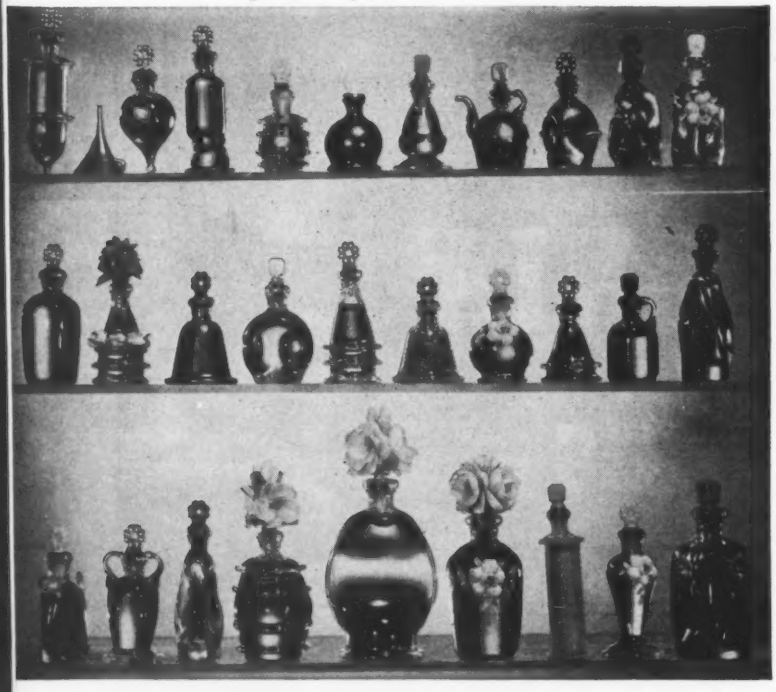


Illustrating range and decoration possible with this one line of Miniatures, from a few drops to 1 oz. Floral designs are hand applied in color. Note example of fine patented filagree metal work on center bottle.



Illustrating the wide range of Vials in sizes from a few drops to 1 oz., available in our standard vial-type bottles. Floral stoppers are made of tiny sea shells (patented).

Package your Products for EYE-APPEAL MEMORY VALUE DISTINCTION



WITH THESE EXQUISITE MINIATURES

★ Available now are dozens of exquisite miniature bottles and vials ranging in capacity from a few drops to an ounce. All handmade of crystal-clear glass. All with our patented exclusive leak-proof, air-tight stopper-applicator.

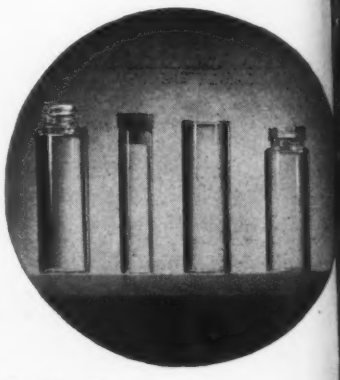
★ Among them you are sure to find one that truly *belongs* to your product, or one that inspires an exclusive package design. It will pay you to investigate these miniatures. Make a date to see them—*soon!*



PATENTED SCREW STOPPER

Glass Industries Vials and Miniatures feature our exclusive patented, interchangeable screw stoppers. Rubber "cushion seal" forms air-tight, leak-proof closure. Stoppers can be easily screwed in or out.

In addition to fine Miniatures and vials, G.I.I. manufactures a line of small utility containers (illustrated at right) for general use; available in quantity and at competitive prices.

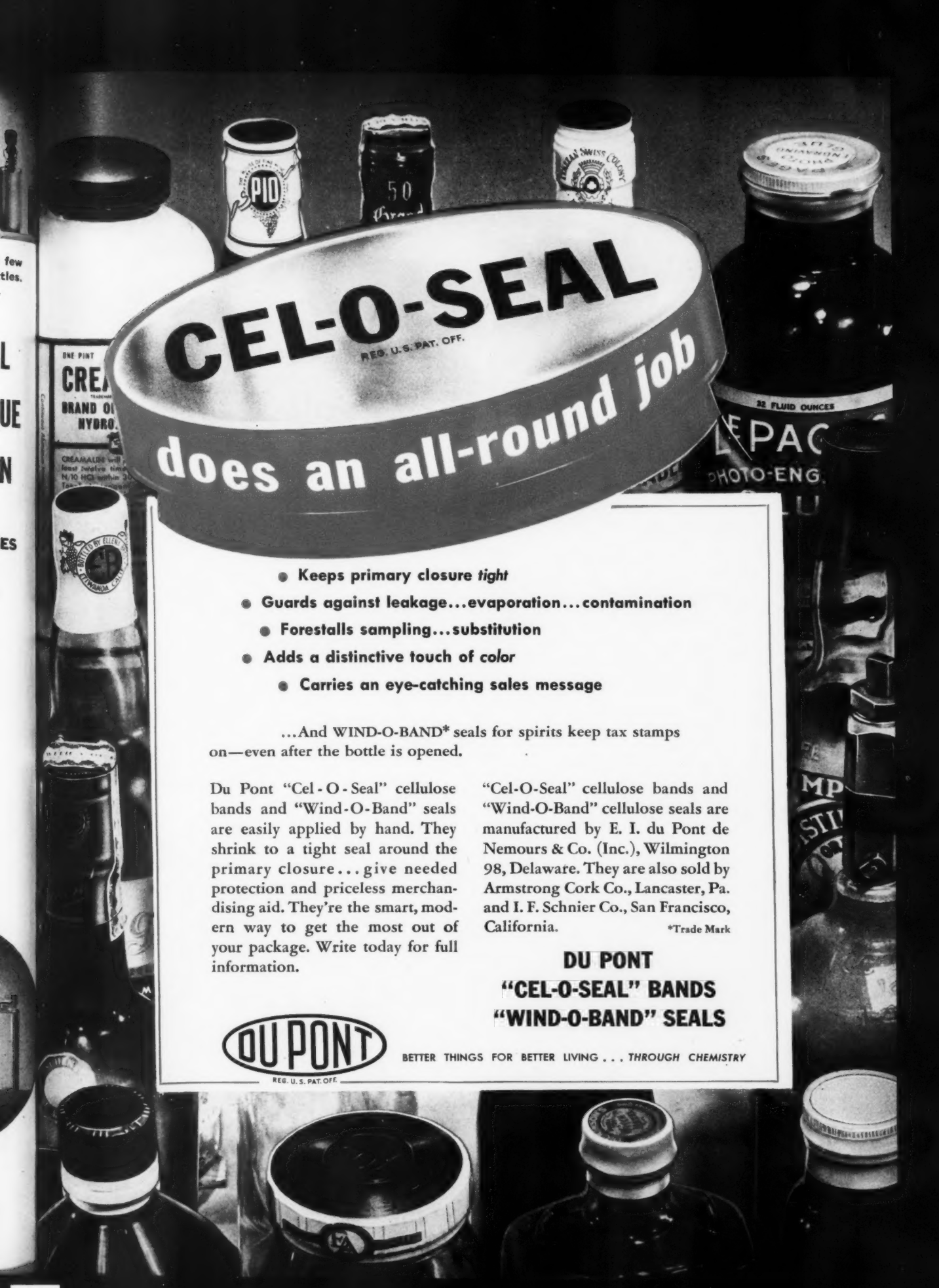


Write for Literature

GLASS INDUSTRIES, INC.

Designers and Manufacturers

10 WEST 33rd STREET **NEW YORK 1, N. Y.**



- Keeps primary closure *tight*
- Guards against leakage...evaporation...contamination
- Forestalls sampling...substitution
- Adds a distinctive touch of *color*
- Carries an eye-catching sales message

...And WIND-O-BAND* seals for spirits keep tax stamps on—even after the bottle is opened.

Du Pont "Cel-O-Seal" cellulose bands and "Wind-O-Band" seals are easily applied by hand. They shrink to a tight seal around the primary closure... give needed protection and priceless merchandising aid. They're the smart, modern way to get the most out of your package. Write today for full information.

"Cel-O-Seal" cellulose bands and "Wind-O-Band" cellulose seals are manufactured by E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Delaware. They are also sold by Armstrong Cork Co., Lancaster, Pa. and I. F. Schnier Co., San Francisco, California.

*Trade Mark

DU PONT
"CEL-O-SEAL" BANDS
"WIND-O-BAND" SEALS

DU PONT
REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

XUM

Armstrong's Glass and

FOOD AND TOILETRY CONTAINERS





BEER, WINE, AND LIQUOR CONTAINERS





MEDICAL, INDUSTRIAL, HOUSEHOLD, and CHEMICAL CONTAINERS





A Glass Container for Every Packaging Need

ARMSTRONG CORK COMPANY

XUM

Armstrong's Closures

FOR ALL-ROUND GLASS PACKAGING SERVICE

IF you're looking for attractive, durable glass containers and dependable, good-looking closures, call on Armstrong.

Armstrong offers a full line of jars and bottles in clear, sparkling flint and light-protective Armstrong's Amber. These containers are manufactured under rigid controls, to high standards of quality. They are light in weight, yet strong and durable . . . ideally suited to food, drug, beer, liquor, and other glass packaging requirements.

SURE-SEALING, SALES-BUILDING CLOSURES

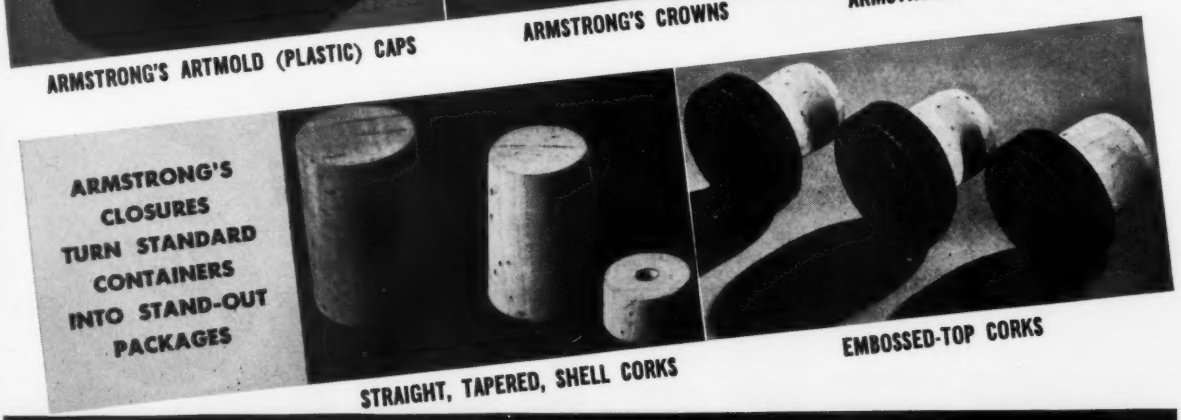
In the Armstrong Closure line, you'll find a wide choice of dependable closures that not only will seal your products safely and economically, but also will add sales-building color and distinction to your package.

Included in the line are the attractive lithographed Armstrong's Metal Caps, on which you may display your name or trademark in color; a complete line of straight, tapered, and shell corks; Embossed-Top Corks and Artmold (plastic) caps, both of which offer wide opportunities for individual color and design; Armstrong's Crowns; and decorative, protective Du Pont's CEL-O-SEAL* bands and WIND-O-BAND* seals . . . which also may be individually designed.

For complete details about any Armstrong glass container or closure, get in touch with your Armstrong representative, or write the Armstrong Cork Company, Glass and Closure Division, 910 Prince St., Lancaster, Pa.

Trade-mark registered by E. I. du Pont de Nemours & Company





Glass and Closure Division, LANCASTER, PA.



Ball

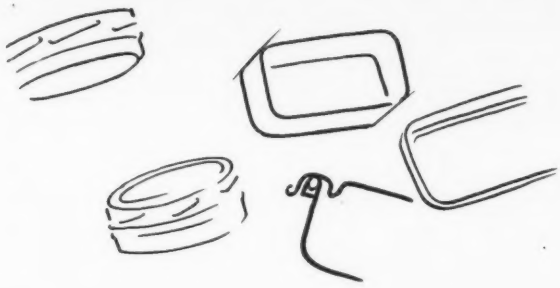
the Aridor Closure Division of

BALL

BROTHERS COMPANY

3428-40 W. 48th Place, Chicago 32

What's behind that vacant stare?



Perhaps we could daydream with you . . .



Thinking about new packages? We don't claim to know all the answers, but we've had a lot of experience in making sealing compounds . . . for cans, jars, pails, drums . . . for regular shapes and odd shapes.

Take this, for example: a while back a customer wanted a cap compound to withstand processing of glass-packed foodstuffs; it took us a time to develop the right thing, but the result was a new type of flowed-in compound, Darex MK, which appears to be the solution to the problem our customer faced. And it may be the key to a lot of other people's problems, too.

On the other side, we haven't yet solved to our own satisfaction the question of how to put cap compound into the square or rectangular snap-on covers . . . it's a question of a machine and a compound. But there are aspects of the Darex MK work that may help here, too. We are working on the machine angle as well as the compound angle, of course.

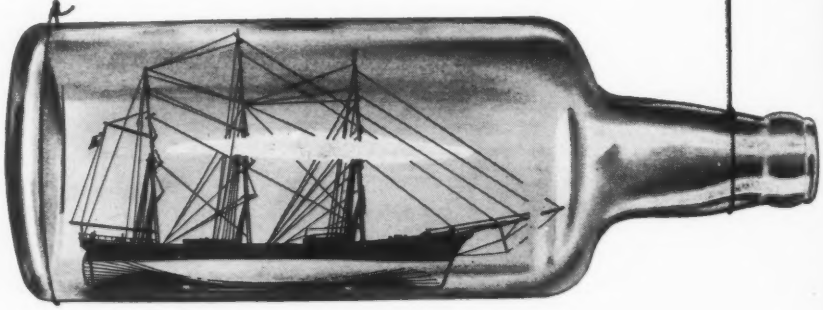
If you've a new package in mind, or if you're just dreaming about one, and are worried about the seal, why not talk with us? We shall be delighted to swap our time with yours.

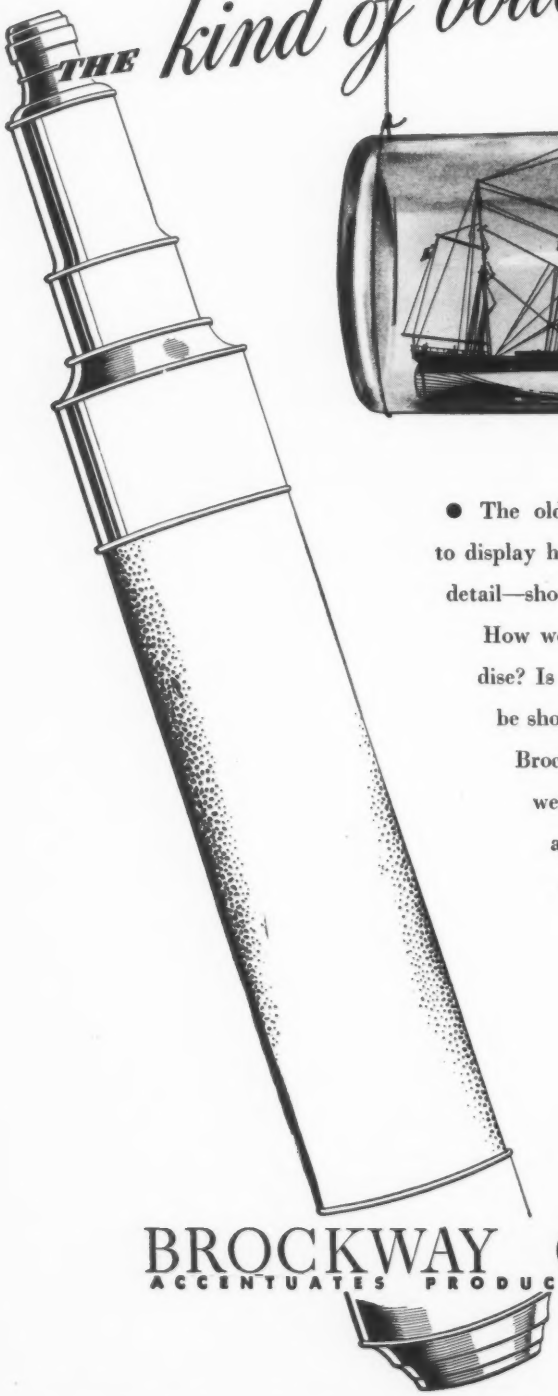
DEWEY AND ALMY CHEMICAL COMPANY CAMBRIDGE 40, MASSACHUSETTS

Darex *flowed-in* Sealing Compounds

XUM

THE *kind of bottles* THEY PUT SHIPS IN...





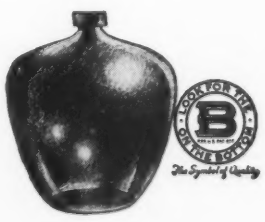
● The old seaman picks a good, flawless bottle to display his craftsmanship. Vivid color, strong detail—shown to the best advantage . . .

How well are you presenting your quality merchandise? Is it hiding behind dull wrappings when it could be shown in clear, brilliant glass . . . manufactured by Brockway? Such smart containers look good, serve well and show what they hold to the best advantage. Give your products a chance to sell themselves—wrap them in glass, for all the world to see and buy. Make color, quality and freshness apparent—inviting shoppers to stop and look . . . Bring your products out in the open with durable, sales-enhancing Brockway Glass.

Brockway Glass Company, Inc., Brockway, Pa.

BROCKWAY GLASS

ACCENTUATES PRODUCT QUALITY



Guarantee

THE CONTENTS OF YOUR CONTAINERS WITH EFFICIENT, EYE-CATCHING *CELONS*





Step One

With a slight twist of fingers, CELONS are opened and applied. Operators easily keep pace with automatic bottle sealing or capping machines.



Step Two

Shipped and stored in solution, CELONS are applied WET, slipped over bottle cap or cork and dry in carton on way to store room or customer.



Step Three

In drying, CELONS shrink trim and skin-tight, forming a tough, sanitary protective seal, adding greatly to package appearance. Made by the millions in our Madison plant.

MANY of America's best-known glass packed products are sealed with *CELON Cellulose Seals.* They fit skin-tight over the bottle closure, making it impossible for dust and dirt to seep in, protecting against tampering, sampling, substitution . . giving excellent product protection. In addition, *CELON Cellulose Seals* add greatly to the attractiveness of the package. Eye-catching, sales-getting decoration is impregnated into the cellulose at time of manufacture, adding merchandising power to the package. *CELONS* are available in many attractive colors, in transparent or opaque material; plain, or decorated. They are quickly and easily applied without machinery, as described in the panel at the left. Investigate the many superior advantages of these economical Cellulose Seals. If you will send us a sample package, our designers will gladly return it *CELON-Sealed,* for your inspection. No obligation, of course.

CELONS *Protect Products*
CELONS *Prevent Waste*
CELONS *Build Prestige*
CELONS *Avoid Tampering*
CELONS *Display Trademarks*
CELONS *Feature Slogans*
CELONS *Aid Sales . . .*

Use



THE CELON COMPANY
MAIN PLANT & GENERAL OFFICES
MADISON 4, WISCONSIN

BRANCH OFFICES OR REPRESENTATIVES IN 25 PRINCIPAL CITIES

XUM

"I'VE got a SWELL boss!"



Miss Jones: *"I mean it, Gloria! He's swell!"*

Gloria: *"Say, hold on there— what did he do?"*

Miss Jones: *"Well, I saw one of those popular Glass Container ads — you know, Mr. Slowey's ads — and read it to B. J. It said: Cash in on your accumulations of containers and caps. All shapes, all sizes. B. J. called Mr. Slowey right away."*

Gloria: *"So what happened?"*

Miss Jones: *"Mr. Slowey bought up our stockroom pile of bottles and caps just like that! Now we have lots of free space, a nice check, and I have a new fur coat that's a honey. That's B. J.'s bonus to me! Gee, I've got a swell boss!"*

THAT'S it, friends! Call us this minute— We BUY (and SELL!) containers and caps in All sizes, all quantities.

phone. ALgonquin 4-6066

glass container & cap outlet co.

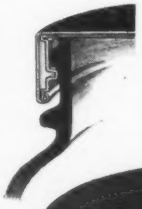
876 Broadway
New York 3, N. Y.

MeritSEAL

...makes a hit

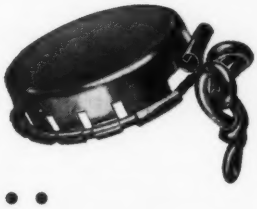


MERITSEAL is right in tune with the finest cosmetic packages. Its smart appearance and sparkling colors strike a responsive note in a quality conscious market. ◆ But Meritseal has more than beauty. Its novel construction, incorporating several mechanical advancements, consists of a shell formed from sheet metal. Into this shell is inserted a suitable liner and a non-binding thread made from a strip of non-corrosive metal. The lower edge of the shell is curved inward locking the thread securely in place. Best of all, the cost is less than most closures of comparable good looks. ◆ Send for samples and full information. See for yourself, right on your own product, how really good looking and efficient Meritseal is. Be sure to mention the size of caps that will fit your package and the colors you prefer.





KORK-N-SEAL



licks tough sealing jobs...

Tough sealing jobs are the ones we like best. It's on these jobs that KORK-N-SEAL gets the chance to show what it can really do. This famous closure gives efficient, dependable sealing on either tin or glass containers, and its application is economical and trouble-free on the production line. Many manufacturers have standardized on KORK-N-SEAL for their entire lines, because it takes all sealing jobs in stride. We'll gladly send you samples and full information so that you can see for yourself how securely it seals . . . and how handy it is to use.

CROWN CORK SPECIALTY CORPORATION, DECATUR, ILLINOIS

Division of Crown Cork & Seal Co.

NEW YORK: 60 East Forty-Second St. • *CHICAGO:* 4343 West Fifth Ave.

XUM

THREE *ESSENTIALS* FOR PACKAGING VALUABLE PRODUCTS

1. POSITIVE SEAL
2. FINGER-TIP OPENING
3. ABSOLUTE PROTECTION AGAINST COUNTERFEITING



GUARDIAN, long tops on these foremost requirements, also provides convenient reseals, clean pouring and distinctive appearance.

Write now for details specially applicable to your product

GUARDIAN Safety Seal CO.

35 EAST WACKER DRIVE • CHICAGO


Green River
VITALONE
CREAM
Glasscrafters
...OFFER IMPORTANT NEW
CERAMIC PACKAGE TREATMENTS
Now "ordinary" stock bottles can be transformed into colorful and unusual glass packages that enhance and increase the salability of your product. Through the use of ceramic coloring, lettering and decorating, satin frosting, crystalline icing and other permanent treatments, Glasscrafters' skilled personnel are literally working wonders for products of every description. Let us help plan the perfect package for your present or future product; write for explanatory illustrated booklet today.
GLASSCRAFTERS Division of
W. BRAUN COMPANY,
300 N. CANAL ST., CHICAGO 6, ILL.
347 FIFTH AVE., NEW YORK 16, N. Y.

You sell

STRENGTH AND GOODNESS



You sell

BEAUTY



You sell

HEALTH



XUM





WE PACKAGE THEM

When you use H-A Glass Containers you are assured of packing efficiency; easy handling by the distributor and retailer; and sales design—good-looking enough to make Mr. and Mrs. Consumer buy.



HAZEL-ATLAS GLASS COMPANY

Wheeling, W. Va.

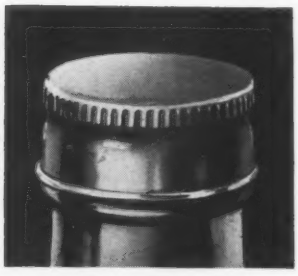
Better Protection FOR GLASS-PACKED PRODUCTS

Better because Alseco Aluminum Seals are applied by a radically different process that gives a more secure seal. They are *Rolled-On,* not screwed on. Every single cap is *tailor-fitted* to each container. That gives you (1) uniformly correct sealing compression of the liner; (2) squarely seated caps that are never cocked or loose; (3) easier removal because the caps are never jammed on too tightly.

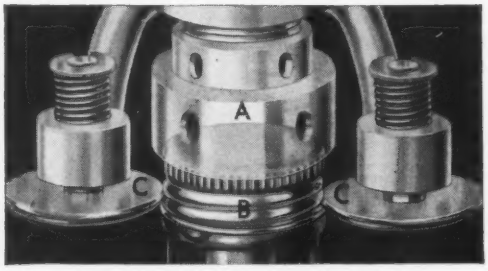
Tailor-fitted sounds expensive . . . *but isn't.* Users will tell you they have found their cost-on-bottle is lower with Alseco Seals. They save in two principal ways: (1) cost of application in man and machine hours is lower than with other comparable sealing methods; (2) losses are virtually eliminated on leakers and breathers.

Figure out your present cost-on-bottle and let us show you how you can reduce it by using Alseco Aluminum Seals, beautifully lithographed to harmonize with your package design.

HERE'S HOW THE ALSECO "ROLLED-ON" METHOD WORKS



BEFORE APPLICATION



Sealing head A applies stationary top pressure on cap B while revolving rollers C form threads



AFTER APPLICATION

Alseco R-O Seals (and other Alseco Seals applied by the same basic method) come to you with straight sides, not threaded. The liners, whatever type you require, are securely held inside each cap.

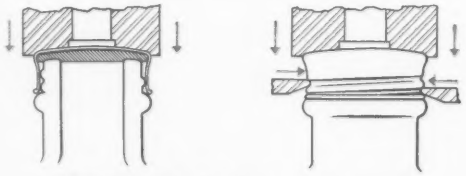
Fast, efficient, automatic machines apply them to the filled container. First, the desired amount of pressure is applied on top of the cap to imbed the glass finish in the liner. Pressure is approximately 10 lb. per m/m of diameter. While the cap is held under pressure in contact with the glass lip, revolving rollers close in and roll the threads into the cap in conformance with the threads in the glass.

Thus, each container is sealed with the same desired pressure. Also, each cap fits its container perfectly because the threads have been tailored to conform to the glass, be it minimum or maximum in dimensions.

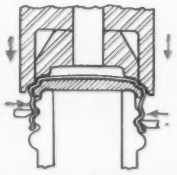
In this method of applying caps there is no friction between the sides of the cap and the container, or between the liner and glass finish, as there is when caps are screwed on. Thus, there can be no damage to the interior finish or to the liner material.

Seals may be applied at speeds as high as 300 per minute with Alseco Machines. These machines have won the high regard of glass packers for their remarkably low operating and maintenance costs. Available in a variety of types and capacities on an economical rental basis.

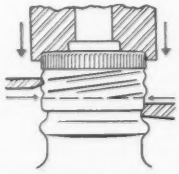
SEVERAL VARIATIONS OF THE "ROLLED-ON" SEALING PRINCIPLE



PLAIN R-O. Plain-skirted cap seated squarely under top pressure to compress liner (left). Revolving rollers close in and form threads (right), using glass threads as the pattern and matching them exactly.



"T-S" SEAL. Pressure block indents a ring in outer edge of the cap, forcing liner down around side of glass finish to give both a top and side seal.



PILFER-PROOF. Bottom of skirt is wiped over a locking ring in glass as threads are formed. Snaps apart on scored line when unscrewed.



SMALL R-O SEAL. For all kinds of products packed in narrow-mouth containers. May be had with plain or knurled finish, flat or domed tops, in any color or private decoration. Made of aluminum, these seals cannot rust. Easy to remove.

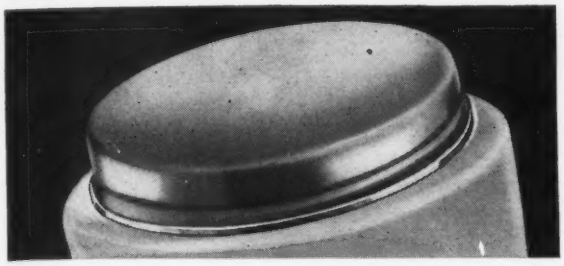




"T-S" SEAL. The greater sealing area given by the Top-and-Side Seal makes it especially suitable for foods and volatile products.



PILFER-PROOF. Liquor, wines, drug products which might be tampered with before they are sold can be protected with this seal.



LARGE R-O SEAL. An airtight closure for food, drug, and cosmetic products packed in jars. Users find that it cuts down evaporation losses greatly. Easy to open. Beautifully lithographed in any colors or design. Made of aluminum, it can't rust and become unsightly inside.







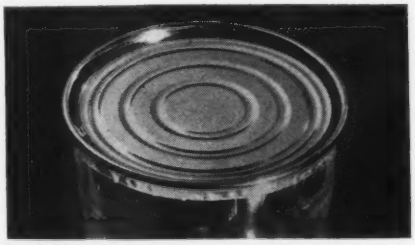
STERICAP. For parenteral solutions. This seal covers the rubber stopper, keeps it sterile. Available in several styles to meet a variety of needs and preferences. Also, in small sizes for serums, vaccines, etc.



GOLDY SEAL. A tamper-proof seal for beverages, foods, drugs, and other products packed in containers requiring no re-seal.



FOIL CAPSULES. A richly decorative cover of sparkling aluminum foil to place over the primary closure, dressing up package.



TUMBLER SEALS. Available in various styles and range of sizes. Shown, an aluminum foil cap for dry products. Attractive. Inexpensive.

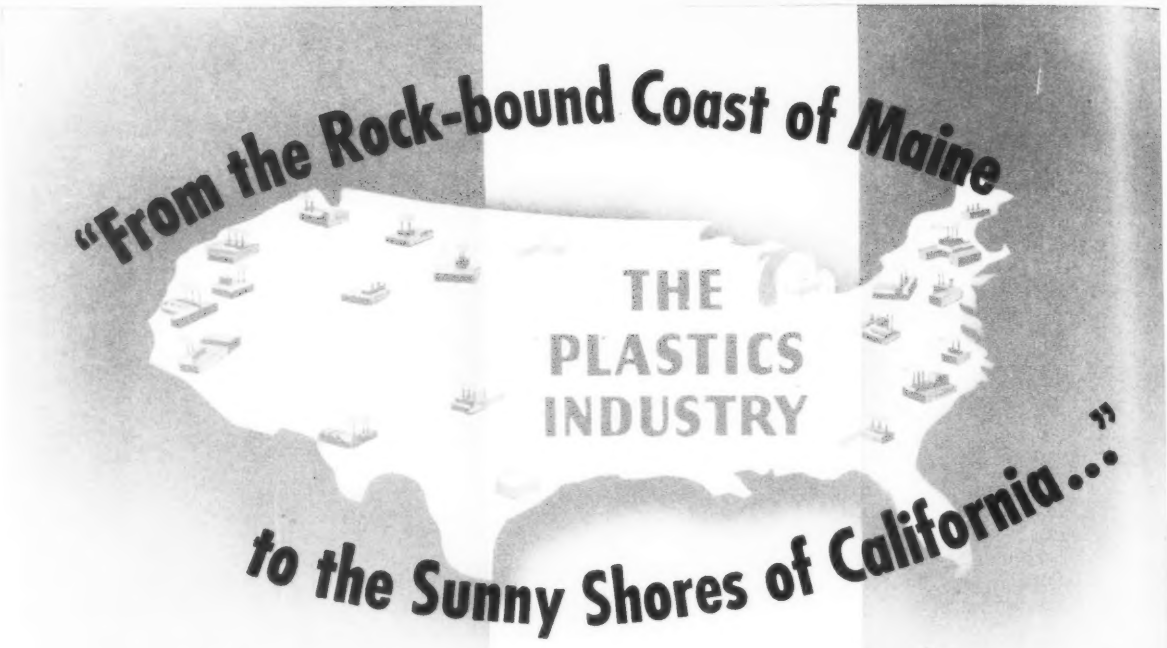
Also . . . SPECIALLY DESIGNED SEALS. The Alseco method of applying seals is highly flexible. As a result, Alseco offers many other seals that are variations of those described above. Consult Alseco on any tough sealing problem and you are likely to come out with just the seal you need.

ALSECO SEALS AND SEALING MACHINES

TAILOR MADE BY ALCOA ALUMINUM

ALUMINUM SEAL COMPANY · 1374 THIRD AVENUE · NEW KENSINGTON, PENNSYLVANIA

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA



This dramatic touch of introductory eloquence—favored figure of speech among the Honorables of the U.S. Senate, provides a perfect preface to the plastics picture.

The plastics industry is all of being "Maine to California"... physically... productively... industrially. It is as national as our Anthem!

From coast to coast and from border to border, it owns and operates natural resources, plants, laboratories, factories, warehouses, offices, showrooms. Its annual billion pound materials output turns over several times in the year. It produces, manufactures, sells, distributes, exports. Thus far, it has given a generation of advancing employment to a sizeable segment of American labor... engineers, technicians, designers, draftsmen, machinists, mechanics, skilled personnel, apprentices.

And, as big as it is, the plastics industry is now launched upon a still greater 30% expansion program.

Potentially, this fast growing and widespread plastics industry is a market place for all industries. To reach its leaders, the men who buy—reach into the readership of the plastics industry's leading and only A.B.C. publication... MODERN PLASTICS... the meeting place and market place of plastic minds!



ABC MEMBER AUDIT BUREAU OF CIRCULATIONS



PLASTICS IN PACKAGING

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Chart: Properties of Molded and Cast Plastics ..... Opposite 462

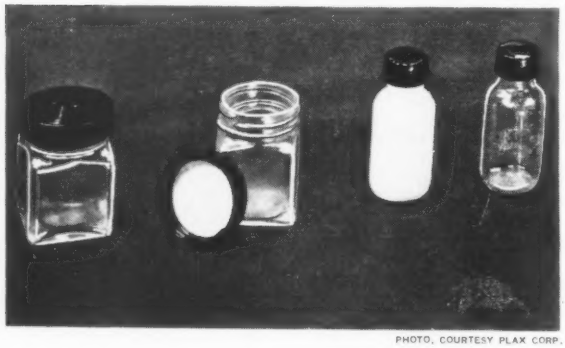
XUM

Basic considerations



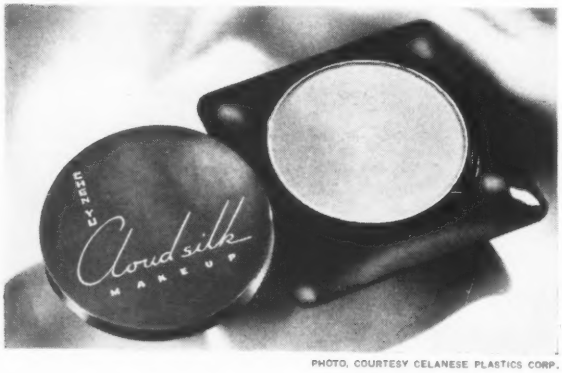
CASE, OWENS-ILLINOIS GLASS CO.; MATERIAL, AMERICAN CYANAMID CO.

1—Result of metal shortages, plastic inhalators, sturdy and cleanly, are here to stay. This one is urea.



PHOTO, COURTESY PLAX CORP.

2—Chemically resistant plastics weigh less than glass, cost more. Packager must consider such factors.



PHOTO, COURTESY CELANESE PLASTICS CORP.

3—Black and scarlet acetate package won award for "beauty, utility, practicability and sales appeal."

Newest of the major materials available to packagers are the eye-appealing plastics. Attractive appearance is an important aim of packaging. Were no other factor to be considered, the use of plastics, available in many forms, would be indicated in an even greater variety of packaging applications than is currently the case.

However, there are other considerations, notably cost, which will affect the decision. The high cost of plastics in comparison to many of the older packaging materials limits its use to cases where its superior merchandising appeal, continued-use nature of the package or suitability for special protective requirements of the product outweigh the extra cost. Frequently when the adoption of all-plastic packages is ruled out, it is still possible to take advantage of the plastic's properties by using it in conjunction with some other material—for instance, as the closure component of a fibre can.

The mere decision to use plastics does not settle the matter. Plastics are available in innumerable forms—flexible or rigid, in the form of sheets, rods, tubes, or molded shapes—in a variety of colors from clear transparent through opaque black, and with widely differing physical and chemical properties. Where a particular form or color is desired, the choice of material is limited. In the packaging of products containing chemically active ingredients, a decision may be made to use plastics instead of some easily affected material, but it is important that the right plastic be selected. Physical strength, dimensional stability, WVT rate and heat resistance are a few of the factors which must be considered in selection of the appropriate material.

No one plastic has optimum qualities in all of these properties. However, within the dozen or so basic types, there are possible literally thousands of variations in formulation, types of plasticizers and fillers. Consequently, within fairly wide ranges, a particular combination of properties may be obtained, and, if necessary and economically justifiable, a material may be tailored to suit the product to be packaged.

A thorough knowledge of the complexities of plastic materials would require an education in chemistry. A packager cannot hope to be familiar with all the innumerable formulations and the properties of each. It is usually sufficient that he have a general understanding, such as may be gained from the following section, of the possibilities of the various types of material and methods of shaping them. With this knowledge, he can draw up package specifications with a reasonable assurance that they can be met. He can leave to the experienced judgment of molder or fabricator the final selection of the specific plastic suitable and of the particular forming method best adapted to the package design and material in question.

Plastic materials used in packaging

The countless varieties of plastic materials are the synthesized derivatives of basic chemicals and are produced in the plants of the large chemical companies. Compounded with varying proportions of other ingredients, including plasticizers, coloring matter, fillers and extenders, they are available in many forms for shaping by various techniques into packages and package components.

This article is chiefly concerned with the characteristics of those materials that are to be shaped by molding or fabricating. Although certain materials in film form—such as cellophane—have been extremely important in the packaging field, information on the characteristics of such forms is contained in *Flexible Packaging Materials*, p. 628, and will not, in general, be covered here. Nor will data on resins for adhesives and coatings, which are discussed in the sections beginning on p. 511 and p. 587.

Plastics materials are usually classified in two groups—thermosetting and thermoplastic—that is, those that set permanently under heat, and those that set upon cooling but may be melted again by reapplication of heat. In general, thermosetting materials are shaped into package components by compression molding, while the thermoplastics are usually molded by extrusion or injection or are fabricated from sheets, rods and tubes. This distinction does not always hold true, however, for developments of recent years have made it possible to compression mold thermoplastics and to injection mold or extrude thermosetting materials.

There follows an enumeration of the types of plastic most widely used in molded or fabricated packages and a discussion of the characteristics that suit each material to its applications. Additional data may be obtained by consulting the charts opposite p. 440 and p. 462.

Thermosetting materials

Thermosetting plastics, which include phenolics, ureas and melamines, are the oldest type of molding compound.

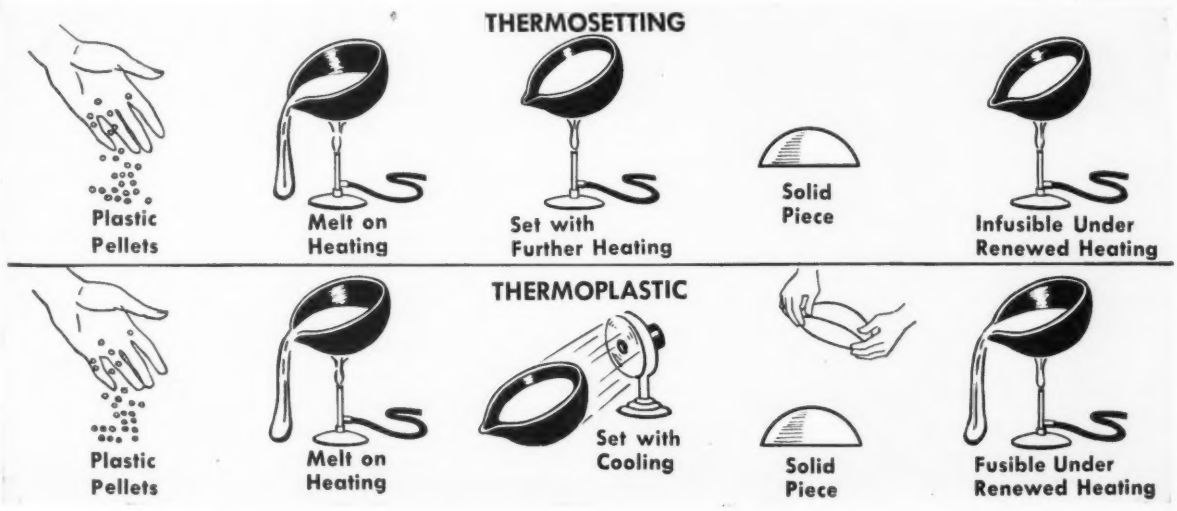
Phenolics—Relatively low cost of this material encourages its use in packaging whenever its other characteristics are suitable. Desirable properties of phenolic packaging components are their hardness, durability, water resistance, dimensional stability and heat resistance. Where necessary, special-purpose compounds are prepared, such as those with improved resistance to acids and alkalis. Resistance to oil and grease is useful in packages for lotions and creams.

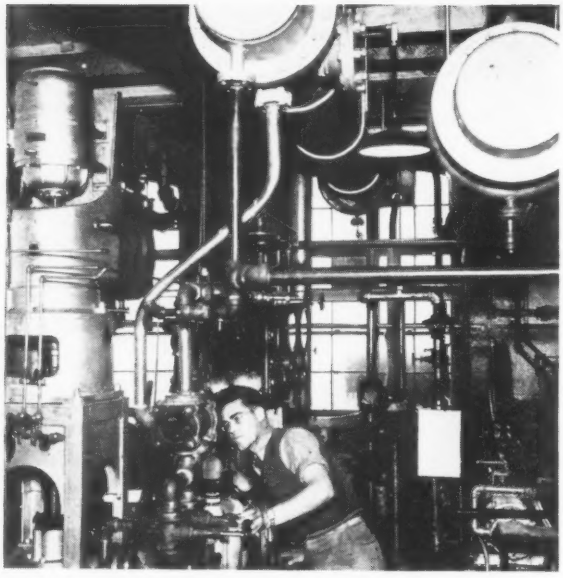
Principal restriction upon the packaging industry's use of phenolics has been the fact that the range of stable molded-in colors is limited to browns, blacks and other dark shades, which are often felt to be less sales-appealing than brighter colors.

Phenolics have a well-established hold upon the closure field. The materials used for this purpose are especially formulated for high torque strength, good water resistance, gloss and minimum odor and taste characteristics. Dimensional stability of phenolics is particularly useful in closure applications. Due to the excellent properties and low cost of the material, as well as to the highly specialized molding methods, volume production of high-quality inexpensive caps is possible. These phenolic closures find particularly wide use on jars and bottles for wine, liquor, drugs and other standard items. Where color is important, however, as in the cosmetic field, phenolic closures are less often used.

Phenolics have also been used for molded boxes, particularly those intended for consumer re-use. How-

CHART, THE RICHARDSON CO.





1—From storage tanks, chemicals are piped to kettle where under heat they react to form phenolic resin.

ever, the advent of other materials with a greater color range at competitive prices may restrict the future use of phenolics in this type of application.

Ureas—Urea containers are odorless, tasteless and resistant to organic solvents. Not so strong nor so water resistant as phenolics, and more expensive, ureas are nevertheless better suited for certain decorative packaging applications. Their advantage in this field is the wide range of stable opaque and translucent colors obtainable by addition of dyes to the colorless resin and the white alpha cellulose filler.

For this reason, much urea is used for closures in the food and cosmetics trades, where its lustrous beauty is often the keynote of the package styling.

Urea has also been well proved in hundreds of applications where it serves as the primary container. Cosmetic jars, using urea alone or in combination with other plastics, are good examples. In boxes for watches, jewelry and other gift merchandise, antique ivory effects are possible. Premium packages, such as kitchen cleanser holders, are an important urea use.

Melamines—These resins combine the color range of ureas with the greater toughness, acid resistance, water resistance and dimensional stability of phenolics. However, melamines are not widely used in the packaging field. They are more expensive than either phenolics or ureas, one or the other of which is usually satisfactory in any thermosetting packaging application. Where the application requires both pastel color and high warpage resistance, urea-melamine blends are used.

Thermoplastic materials for molding

Although differing in many respects, thermoplastics have one advantageous characteristic in common. They are all basically transparent and, therefore, the addition of coloring matter permits an unlimited range of opaque or transparent tints. It is this transparency that has enabled such materials to reach their present importance in the decorative packaging industry.

Thermoplastics for packaging applications are available in sheet form or as molding compounds. The greater speed and lower cost of injection molding, as compared to compression, often offsets the higher cost of thermoplastics. It is among these materials that most of the recent developments have occurred.

Polystyrene—Most important injection molding plastic for packaging purposes is polystyrene, even though it is a relatively high-cost material.

Since styrene has high moisture resistance and since its molding compounds do not contain plasticizers, molded pieces are free from shrinkage or other variation in dimensions, even over long periods of time. Because of this high dimensional stability, it is possible to design a polystryene cosmetic container with a friction-fit top—a specification many plastics cannot meet.

The material is tasteless and odorless. It has excellent resistance to alkalis and weak acids and is insoluble in lower aliphatic alcohols, petroleum hydrocarbons, glycol ethers and some organic esters. Such factors have led to its use for closures of chemical containers and for packaging cosmetics and drugs. However, polystyrene is attacked by strong oxidizing acids and is soluble in aromatic and chlorinated hydrocarbons. Therefore, it is advisable to make tests with each product to be packaged.

Colorability of polystyrene is excellent, and clarity has been greatly improved during the past ten years. These appearance characteristics are of importance in the cosmetic field.

The combination of clarity and generally good chemical resistance, with the further factor of light weight, has led to several experiments involving the substitution of blown polystyrene bottles for those of glass in the packaging of such products as drugs. Polystyrene, though more expensive than glass, is about one-third the weight. This greatly reduces shipping charges, particularly when air transportation is utilized. However, while stronger than glass, styrene is somewhat brittle and does not offer as high a degree of shock resistance as some other plastics.

Vinyl choride-acetate copolymers—These copolymers have found their greatest packaging use in film and sheet form, but they are also potentially important as molding compounds, when increased production lowers cost. They are clear, odorless, tasteless, nontoxic, chemically resistant, moisture resistant and dimensionally stable. In such characteristics, they are similar to polystyrene. However, vinyl chloride-acetate copolymers are more shock resistant, and therefore finished molded containers are likely to be less fragile.

Different formulations may be produced for specific end uses by varying the proportions of chloride and acetate, and by addition of plasticizers varying degrees of resilience or flexibility may be obtained, including a transparent rubber-like material. Such a variety of

forms is indeed a challenge to the creative ingenuity of package designers.

Vinylidene chloride—Commercial production of vinylidene chloride did not begin until 1939, and its prewar packaging applications were restricted by the limited supply and relatively high price.

However, in the present packaging picture, the material seems suitable for certain specialized applications where a combination of toughness and chemical inertness is desired. It is resistant to water, acids, alkalis and organic solvents, and is odorless, tasteless and nontoxic. Injection molded pieces exhibit exceptional toughness and dimensional stability.

Polyethylene—Although the most publicized packaging use of one new thermoplastic, polyethylene, has been in the form of a heat-sealable film, it is also available as a compound for molding. Its resistance to corrosive chemicals should prove useful in special-purpose containers and leakproof screw caps. The material is odorless, tasteless and has no toxic effect on foods. These facts plus its low water-vapor permeability suggest its use in rigid form in containers for milk and other liquid foods. It is also available in nonrigid form, for other packaging uses.

Polyamides—Polyamide (nylon) resins are another comparatively new thermoplastic to the packaging industry, since most available material was absorbed for military purposes soon after it first appeared on the market. Durability and resistance to breakage are the chief advantages obtained by using nylon in containers. The material's aging properties and resistance to chemicals are good. In some types of nylon, color is limited to translucent ivory, while others are transparent and colorable.

Acrylics—The transparency of methyl methacrylate is unsurpassed by that of any other plastic. In general, packagers prefer to use colorless transparent acrylics. However, by addition of pigments and dyes, it is possible to obtain pastel-tinted molding powder, or even deep colors or frosted effects.

In addition to their excellent appearance value, acrylics possess the advantages of light weight, extreme toughness and rigidity. Because of good water resistance, the material is dimensionally stable. It, too, exhibits a marked chemical resistance.

Granular solids and molding powders are available for extrusion, injection and compression molding. A technique, known as three-dimensional intaglio carving, has been developed for decorating molded sections to simulate imbedded flowers and other designs. This has already been used in decorative packaging.

Acrylic molding material is used chiefly to produce re-use and luxury packages. Especially is this true in the cosmetics field, where the beauty of its sparkling crystal-like clarity is an important factor in the sales appeal of the packaged merchandise.

Cellulose acetate—For packaging, this is the chief of the cellulosic molding materials. It was the first of the thermoplastics to be injection molded and is still widely used for many standard applications. In transparent form, it lacks the crystal-like quality of the acrylics, but, on the other hand, it is less expensive and therefore more suitable for some packaging uses. Molding compounds are also available for the production of containers in a limitless range of opaque colors. Tough and resilient, cellulose acetate has been used in presentation boxes and in cosmetic jars and closures. Where dimensional stability is important, the high acetyl grade is preferable.

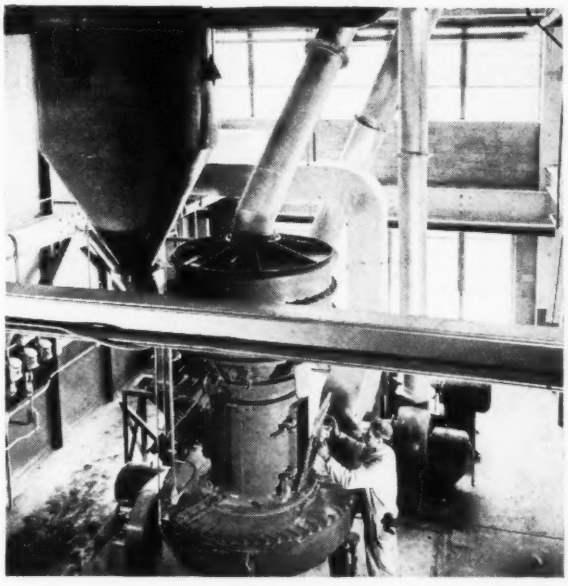
Cellulose acetate butyrate—This material is even tougher than acetate, more water resistant and more dimensionally stable. It is well adapted to the molding of razor cases, kits, etc. However, packaging applications are somewhat limited by the odor and taste of the material, which make it unsuitable for use with cosmetics, drugs or foods. Extruded transparent tubing has been used to make storage containers for valuable aircraft blueprints, serving as a convenient

2—Cooking completed, the viscous phenolic resin is dumped from kettle to metal cooling floor to harden.

PHOTO, COURTESY MONSANTO CHEMICAL CO.



3—In the Raymond mill shown below, the solidified phenolic resin is ground fine to make molding powder.



method of filing and at the same time protecting the plans from dust. (See also *Strip Coating*, p. 460.)

Ethyl cellulose—Molding materials retain the basic characteristics of cellulose acetate. The higher price is in some cases justified by improved properties. The lower water absorption of ethyl cellulose results in the production of containers that have greater dimensional stability than those of acetate and are preferable for use at extreme temperatures and high humidities. Ethyl cellulose is also tougher than cellulose acetate and lighter in weight. (For another important use of ethyl cellulose, see *Strip Coating*, p. 460.)

Cellulose propionate—Newest of the cellulosics is cellulose propionate, availability of which was announced late in 1945. Dimensional stability, low moisture absorption and high impact strength are qualities that recommend this plastic for packaging duty. Superior flow characteristics result in absence of mold marks and weld lines in finished containers. Because the material is odorless it is suitable for packaging delicately perfumed cosmetic items.

4—In cold water, a solution of cellulose acetate precipitates into flakes. These are washed free of acid and pass into a dryer where water whirls off.

PHOTO, COURTESY TENNESSEE EASTMAN CORP.



5—Woodflour is used as a filler for many plastics. Here, worker is weighing it before placing in mixer.

PHOTO, COURTESY GENERAL ELECTRIC CO.



Thermoplastic sheets for fabrication

Several of the thermoplastics discussed above are also available in the form of sheets, usually transparent, for fabrication into thin-walled boxes, cylindrical containers or display components. Continuous rolls of rigid sheeting, 0.005–0.030 in. thick, have been available only during the last decade. Such sheets are produced by casting and slicing or by extrusion. (For details concerning types of fabricated containers and their manufacture, see *Fabricated Containers*, p. 445.)

Cellulose acetate—This is the oldest sheet material, and is still probably the most widely used. It is supplied in continuous rolls and in cut-to-size pieces. Characteristically the sheets are colorless and transparent. The material is not completely moistureproof and some expansion or contraction occurs in time. This should be considered in designing containers.

Ethyl cellulose—Newer than cellulose acetate sheeting is the ethyl cellulose type. Although generally similar, its fabricating properties are somewhat better. Because of low-temperature strength retention, it can be fabricated even after storage in cold temperatures. Ethyl cellulose is particularly well suited to drawing operations and is frequently used for drawn covers.

Cellulose propionate—Although introduced for injection molding, this material will probably be manufactured in sheets, useful for packaging because of good dimensional stability and toughness. Chief problem at present is that of improving transparency.

Vinyl chloride-acetate copolymers—Sheeting of this material was first available for fabricated containers only for a short time before the war, and its eventual status has therefore not been determined. Although not waterproof, it has higher moisture resistance than the cellulosics, and shows less warpage. It is also tougher. Drawing properties are excellent. The rigid sheeting is produced in all colors and in all degrees of transparency or opacity, although the transparent type is most widely used in packaging.

Acrylics—Transparent acrylic sheeting is used in luxury containers, and also finds wide usage in eye-catching counter or shelf displays for small merchandise. "Edge-lighting" characteristics of the material permit novel effects in such applications.

Acrylic sheets are particularly well adapted for displays because they can be readily fabricated without expensive molds. The plastic softens when heated to approximately 220 deg. F. and can then be bent or twisted to shapes of almost any complexity. A recent designing trend involves the use of acrylics in combination with wood, utilizing to advantage the decorative and utilitarian properties of both.

Manufacturing processes

by Michael A. Brown, Jr.

The fact that plastics materials are plastic at one stage or another is the basis for most of the methods by which they are converted into packaging components. Under certain controllable conditions, such materials pass through a phase in which they are either liquids or flowing plastic masses. Some are originally liquids which can be converted to solids; others are initially solid, but soften and flow when heated and resolidify when cooled; still others are initially solid, soften when heated, but convert to an infusible solid with further heating. In any case, when in a plastic or flowing phase, the materials can be placed in a cavity of the desired shape and dimensions, and can then be set there so that the finished piece will reproduce in reverse the contours of the mold.

In connection with processing methods for plastics, it is well to remember that, in general, the methods have been borrowed from other and older industries. From the rubber industry have come compression and extrusion molding; from metal die-casting has come injection molding; continuous glass blowing has inspired similar processes for blowing plastics.

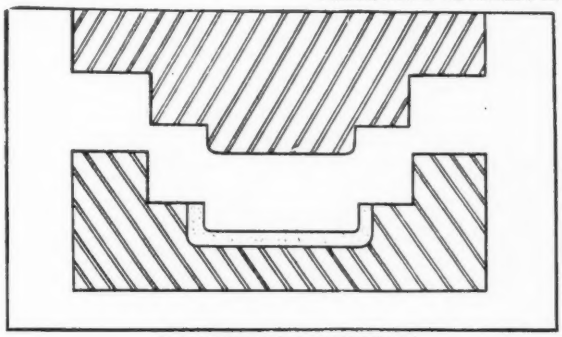
Compression molding

From the standpoint of volume, compression molding is the most important method for forming plastics into package units. It is used to convert the thermosetting phenolics, ureas and melamines, the first two of which are of great importance in packaging.

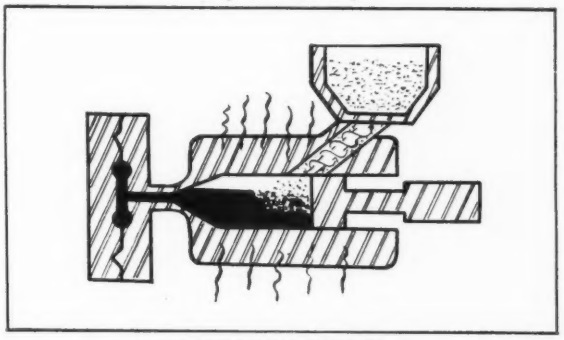
In simplest form, compression molding uses a machined steel mold of two parts, each cored for steam, mounted in a hydraulic or mechanical press. Into the lower part of the mold is placed a measured charge of molding compound which plasticizes when the press is closed. The heat of the mold, having softened the plastic, then causes a chemical change which sets the material into a hard, rigid, lustrous part. In commercial molding, such setups are most common, employing one or many cavities in each mold. But in molding some large-volume packaging items, such as bottle caps, more highly specialized equipment is employed.

In one such method, two molds are employed in one machine, each supplied with as many as 144 cavities. A loading tray fed from a hopper is automatically inserted between the mold halves when opened and a charge simultaneously placed in each cavity. While one mold is thus being charged, the other has been closed under pressure and the actual molding cycle is being carried out. At completion of the cycle, in less than a minute, the mold is opened. As the upper mold half rises, it carries with it the molded caps, which are stripped off by a plate. This is possible without permanent distortion because the hot caps are still soft.

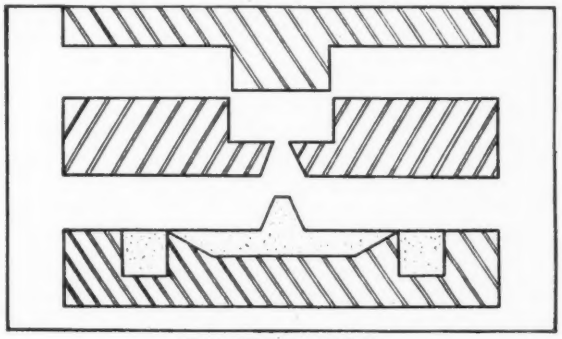
DIAGRAMS, COURTESY THE RICHARDSON CO.



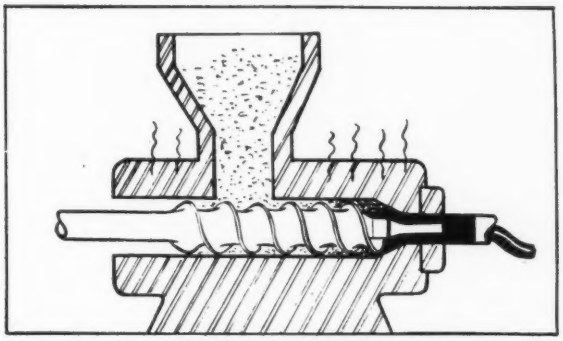
COMPRESSION MOLDING



INJECTION MOLDING



TRANSFER MOLDING



EXTRUSION MOLDING



PHOTOS 1, 2, 3, 4 AND 5, COURTESY BRIDGEPORT MOULDED PRODUCTS, INC.

1—Urea powder for closures is placed in loading fixture, holes in which correspond to location of compression mold cavities. Fig. 2–5 show later steps.

Another type, also developed specifically for closures, is a rotary molding machine. This employs as many as 20 single-cavity mold sets which revolve around the machine. The open molds move to a loading station where a charge of powder is supplied. The molds then close as they move around the machine, during which time the actual molding takes place. They open as they reach a discharge point where the molded caps are unscrewed. Molds are then cleaned with an air blast, following which they return to the starting point. For further data on molding closures, see *Molded Closures*, p. 451.

More conventional compression molding equipment and methods are employed in producing boxes, counter displays and other packaging components.

Injection molding

In injection molding, thermoplastic molding powder is heated and softened in a cylindrical heating chamber, from which it is pushed by a piston through a nozzle into a closed, relatively cold mold where the plastic chills and hardens.

This method, enabling high speed production and almost completely automatic operation, offers many advantages in general molding practice. In packaging, however, injection molding has not yet become as important as compression molding. For general-purpose closures, for instance, the specialized compression molding methods are more economical. Injection molding is of growing importance, however, for special-purpose or decorative closures of polystyrene, or cellulose acetate gift or luxury boxes, particularly in the specialized field of cosmetic packaging.

Transfer molding

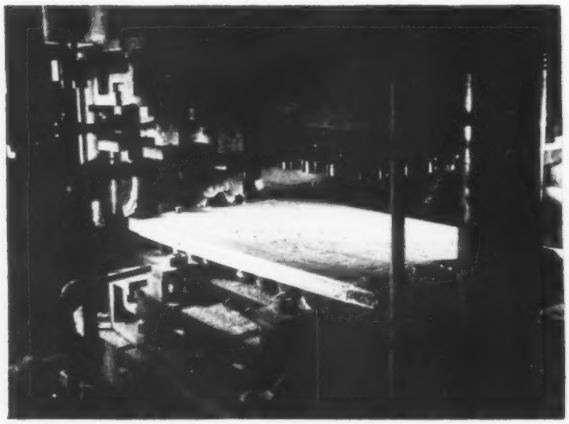
This is, in effect, the injection molding of thermosetting materials, for the plastic is subjected to heat and pressure and is then forced into a closed mold cavity where it is cured. However, only one charge of material is handled at a time, whereas in injection molding a continuous reservoir of material is being preheated and held in readiness at all times.

One advantage of the transfer molding of thermosetting plastics is that, due to the ease with which the material fills each cavity, no sudden and excessive strain is placed upon weak projecting mold parts. Heavy, thick sections of molded parts are filled out with a completely softened homogeneous mass of molding material, and cure cycles for such sections are reduced. However, the method has never been an important one in the field of packaging.

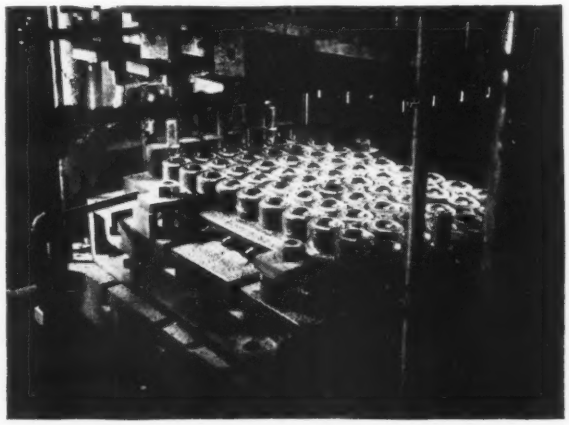
Extrusion molding

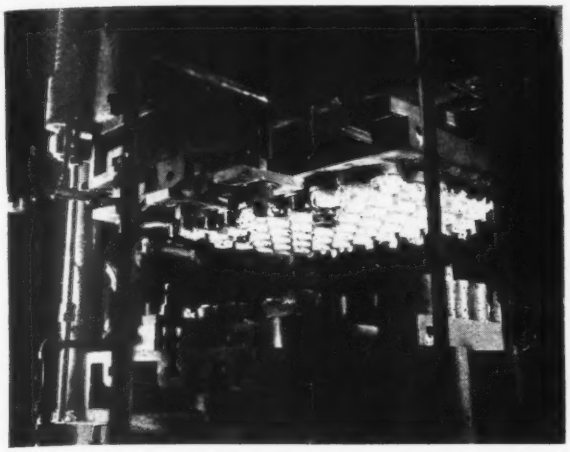
In the continuous extrusion process, plastic is fed constantly into the extruder. By the action of a mechanical screw it is spiraled through a heated cylinder where it forms a molten mass. Continuing pressure finally forces this softened material through an orifice in a die, the orifice shape determining the shape of the finished ex-

2—Loading fixture is positioned over mold cavities. Tripping of lever releases molding powder into them.

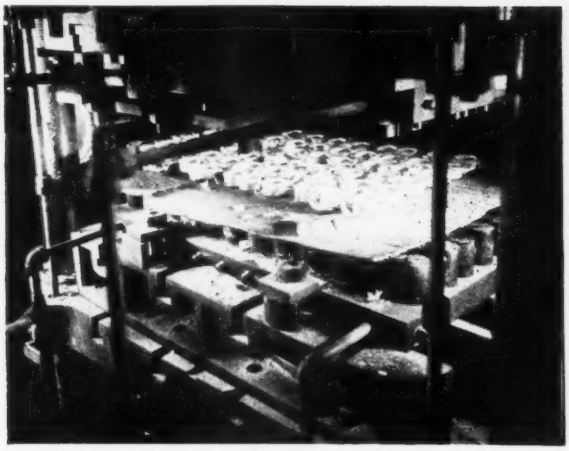


3—Here the loaded mold is shown just before it is closed for the actual compression molding operation.





4—Cure completed, upper mold half is raised, taking with it molded closures which stick to force plugs.



5—When mold is opened further, knockout pins on force plugs eject molded caps onto unloading board.

trusion. As the hot plastic comes out of the die, it may be cooled either by air or by liquid.

This method is chiefly used for thermoplastics, although it has been adapted to thermosetting materials as well.

Limitations of the method are apparent. Rods, tubes and strips produced must be of uniform cross section, and these lengths require further fabrication before they become finished packaging items such as displays, bottles or boxes.

One development in extrusion, however, will prove very important in packaging. This is a process for extruding thermoplastic in tube form and slitting it to produce sheeting.[1] The process is much less expensive than conventional methods of casting blocks and then planing them into sheets. Consequently, the new method will permit the use of transparent packages fabricated from sheeting for a greatly increased number of products, particularly in the low-cost class.

[1] See "Low-cost Plastic Sheet," MODERN PACKAGING XIX, No. 9, 110 (May, 1946).

Blow molding

During the war, blow molding of thermoplastics, especially styrene, but also the cellulosics, was developed to the commercial stage. The process represents a substantial modification of glass blowing methods. In the two-stage operation, a tube is first extruded and fed into a hinged mold which closes around it and nips off the desired length. Air introduced into the hot soft tube expands it to the size and shape of the mold. As the material cools and hardens, the plastic bottle is ejected, and the cycle is repeated.

Fabrication

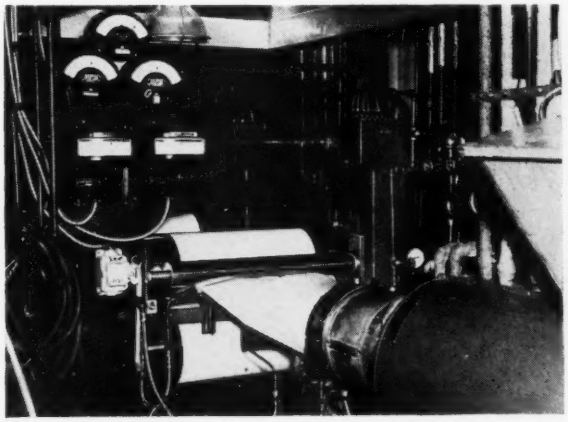
Fabrication of sheet plastics into semi-rigid transparent packages or displays is still largely a hand operation. Only slowly is fully automatic and semiautomatic equipment being developed, although the need is obvious. The usefulness of semi-rigid transparent packaging will certainly increase when fully automatic equip-

6—For shaping thermoplastics, Standard Products Co. uses this large mold in a 32-oz. injection machine.



7—In producing low-cost sheet, plastic is extruded in continuous tubes, slit, flattened, wound in rolls.

PHOTO, COURTESY TENNESSEE EASTMAN CORP.





PHOTO, COURTESY SHOE FORM CO.

8—To make tote boxes, cellulose acetate sheets are preheated on steam table, placed in swaging press.

ment, comparable to that used with metal, becomes commercially available. Although such machines have made their appearance, they are not yet used on a large scale in packaging.

Drawing, in which a preheated blank is inserted into a die and stretched into shape, is finding additional uses. Improved techniques permit production of deeper and larger drawn shapes.

More detailed information concerning the various fabricating methods will be found under *Fabricated Containers*, p. 445.

Casting

Casting, as a method of producing plastic parts for packaging, has never been of great importance, except in making sheets and other forms for subsequent fabrication. Cast shapes of phenolic, for instance, require considerable machining and finishing. Cast phenolic has been used in counter displays, however, to a certain limited extent.

Laminating

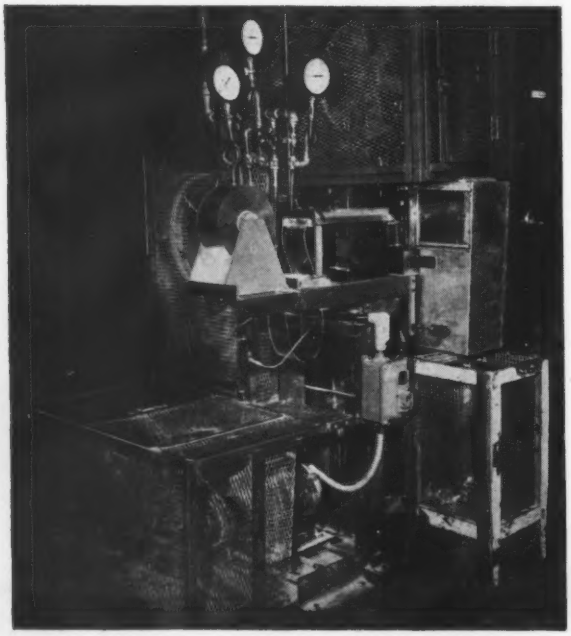
Standard high-pressure laminating, a process of great importance in the plastics industry, has not found substantial use in packaging. This process involves the pressing of stacked sheets of resin-impregnated paper or cloth into hard, rigid, substantially homogeneous plates or sheets. To a limited extent, translucent urea laminates have been used in display and sign work, but in actual packaging this class of material has never been important.

The use of laminates may be greatly broadened by two significant wartime developments—postforming and low-pressure laminating. The first enables production of opaque, structurally strong units by heat-forming a blank flat laminate, in much the same way that transparent thermoplastics are shaped, but providing much greater rigidity and strength in the finished product.

Low-pressure laminating, or impression molding, is one of the newest and most promising of recent fabrication methods. In a sense, impression molding is a combination of casting and laminating. Paper, cloth, fibrous butts or other reinforcing material is impregnated with a liquid plastic resin. One or more layers are laid up in a form or mold and pressure is applied, together with moderate heat, to initiate a reaction in the resin. The final product is hard, impervious and structurally strong. Because pressure is low, equipment needed is light and large parts are thus feasible.

9—Fully automatic drawing machine speeds production and lowers cost of transparent containers.

PHOTO, COURTESY CELANESE PLASTICS CORP.



10—Small blown containers can be made in multiple on a single flat sheet, then sawed apart and finished.

PHOTO, COURTESY ROHM & HAAS CO.



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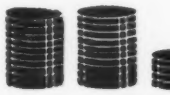
ROHM & HAAS CO.



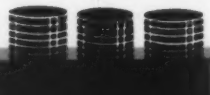
XUM

PLA

COMPRESSION M

MATERIAL	PHENOLIC (Wood-flour-filled phenol-formaldehyde or phenol-furfural molding materials)	(Cellulose-fill
RELATIVE MATERIAL COST*	 10 UNITS	
HOW TO IDENTIFY FINISHED PARTS	Very rigid, with no give when stressed. Does not burn readily. Colors black, brown or dark; always opaque. Luster not as high as thermoplastic.	Very rigid, with very slowly, or n extinguishing wh opaque or transl luster.
GENERAL CHARACTERISTICS	Color limited to dark opaque shades; tendency in lighter colors to discolor. Luster good but not as high as thermoplastics; fair to good resistance to scratching. Excellent dimensional stability in proper formulations. No plasticizer and low shrinkage. Lower water absorption than thermoplastics except styrene. Excellent mechanical properties, high rigidity, high torque strength. Shock strength good but lower than vinyl or cellulose materials. Heat resistance better than any other packaging plastic (about 300° F.). Formulations available with minimum taste and odor characteristics. Excellent resistance to alcohols, oils, greases, petroleum derivatives and to weak acids. Poor resistance to alkalis.	Colors include fast) in opaque cellent luster, co Fair dimensio and water absor ferior to other co Strength prop resistance (abou than thermoplas Excellent taste Good resistanc weak acids. Poo
TYPICAL PACKAGING USES	Bottle and jar closures. Re-use boxes. Displays for small products.	Closures, jew displays.
TRADE NAMES	Bakelite, Catapak, Drackett, Durez, Durite, Insurok, Makalot, Resinox, Textolite.	Beetle, Plasko

* Taking into account price per pound and specific gravity, but not possible differences in fabricating costs.

MATERIAL	STYRENE (Polystyrene molding materials)	ACETATE (Cellulose acetate molding ma
RELATIVE	 17	
	Very rigid. Breaks sharply. Glass-like tinkle sound when dropped.	Flexible in thin sections, elastic. Dull sound when

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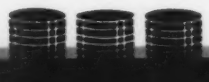
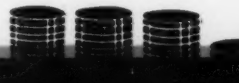
LASTICS FOR PACKAG

ION MOLDING MATERIALS

	UREA ellulose-filled urea-formaldehyde molding materials)	MELAMINE (Cellulose-filled melamine-formaldehyde molding materials)	
	 24 UNITS	 39 UNITS	
	rigid, with little "give" when stressed. Burns owly, or not at all, with characteristic odor, uishing when flame is removed. Usually in e or translucent white or pastel colors. High	Similar to urea, difficult to distinguish.	Clear, t color. Bu
	rs include all whites and all shades (light n opaque and translucent. No crystal. Ex- t luster, comparable to thermoplastics. dimensional stability because of shrinkage ater absorption. Better than acetate but in- to other compression molded plastics. ngth properties good. High rigidity. Heat nce (about 190° F. for short periods) better thermoplastics but inferior to phenolic. ellent taste and odor characteristics. d resistance to alcohols, oils, greases and to acids. Poor to fair resistance to alkalis.	Color range (same as urea) includes all whites and pastels (light fast) in opaque and translucent. No crystal. Excellent luster. Excellent dimensional stability, comparable to phenolics. Low water absorption and lower shrinkage than urea. Strength properties comparable to phenolics. High torque and good shock strength. Heat resistance almost as high as phenolics, (about 250° F.), better than urea plastics. Excellent taste and odor characteristics. Excellent resistance to alkalis (much better than other compression materials), very good resistance to oils, greases and organic solvents. Good resistance to acids. (Melamine-urea blends retain to some degree the features of straight melamine at lower cost.)	Excellen Surface sc Fair to varying hu Good st shipping. Good fa and beads good hot-c and marki Excellen Excellen acids and vents.
	ures, jewelry boxes, cosmetic containers, ys.	Same as urea to meet more stringent conditions.	Rigid t plays.
	tle, Plaskon.	Catalin melamine, Melmac, Plaskon melamine, Resimene.	Eastma

† Direct c

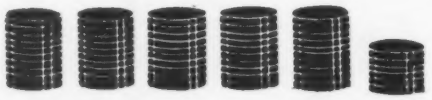
INJECTION MOLDING MATERIALS

TATE molding materials)	ACETATE BUTYRATE (Cellulose acetate butyrate molding materials)	ETHYL CELLULOSE (Ethyl cellulose molding materials)	(Met
			
sections, but not	Similar to acetate. Characteristic	Similar to acetate, not readily dis-	Quite

XUM

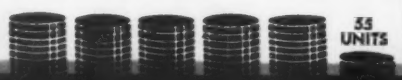
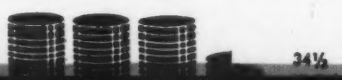
CKAGING AT A GLAN

RIGID SHEE

	ACETATE (Cellulose acetate rigid sheeting)	ETHYL CELLULOSE (Ethyl cellulose rigid sheeting)
yde molding		
		
ish.	Clear, transparent. Stacked sheets show bluish color. Burns slowly with characteristic odor.	Not readily distinguishable from aceta
ll whites and slucent. No mparable to ower shrink- phenolics. h. Heat re- out 250° F.), cs. better than d resistance Good resist- e degree the cost.)	Excellent retention of clarity and transparency. Surface scratches fairly easily. Fair to good dimensional stability; warps under varying humidities. Poor moisture barrier. Good strength properties, usually protected in shipping. Heat resistance low but adequate. Good fabricating properties. Bends, scores, cuts and beads readily at room temperatures. Fair to good hot-drawing. Cements easily. Takes printing and marking well. Excellent odor and taste characteristics. Excellent resistance to most oils and greases, weak acids and alkalis. Poor resistance to organic solvents.	Excellent retention of clarity and tra Surface scratches fairly easily. Burns sl Fair to good dimensional stability, w varying humidities, slightly lower water than acetate. Poor moisture barrier. Good strength properties, somewhat acetate, with no low-temperature emb but shipping protection needed. Heat low but adequate. Excellent fabricating properties. Be and cuts readily even at low temperatu lent hot-drawing. Cements easily and ing and marking well. Excellent odor and taste characteristic Excellent resistance to most oils and to weak acids and alkalis. Poor resist ganic solvents.
conditions.	Rigid transparent boxes, tubes, covers and displays.	Rigid transparent boxes, tubes, drawn display components.
melamine,	Eastman acetate, Lumarith, Nixon CA, Vuepak.	Ethocel, Celcon, Nixon EC

† Direct comparison of cost between sheet and molding materials should be avoided; containers made of sheet ge

ERIALS

ULOSE ng materials)	ACRYLIC (Methyl methacrylate molding materials)	VINYL COPOLYMER (Vinyl chloride-acetate copolymer molding materials)	(Cast p
			
not readily dis-	Quite rigid, but with more give than styrene. Sharper sound when	Flexible but not readily elastic. Dull sound when struck. Will not	thick sec

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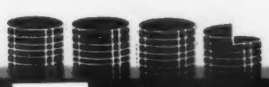
ANCE

HEET†

ULOSE d sheeting)	VINYL SHEETING (Vinyl chloride-acetate copolymer rigid transparent sheeting)	MATERIAL
56 UNITS	 56 UNITS	RELATIVE MATERIAL COST
from acetate.	Not readily distinguishable from other sheeting. Less brittle on flexing. Stacked sheets may show slight tannish color. Usually self-extinguishing.	HOW TO IDENTIFY FINISHED PARTS
ity and transparency. . Burns slowly. tability, warps under ower water absorption barrier. omewhat better than rature embrittlement, ded. Heat resistance erties. Bends, scores temperatures. Excel-easily and takes print- aracteristics. t oils and greases and Poor resistance to or-	Good retention of clarity and transparency, with some tendency to yellowing on aging. Surface scratches fairly easily. Good dimensional stability, because of low water absorption and low plasticizer content. Less warpage in than cellulose materials. Poor moisture barrier. Good strength properties, somewhat better than cellulose materials. Less brittle than acetate, no low-temperature embrittlement, but shipping protection needed. Heat resistance low but adequate. Excellent fabricating properties. Bends, scores, cuts and beads readily even at low temperatures. Excellent hot-drawing. Cements easily and takes printing and marking well. Excellent resistance to strong acids and alkalis, alcohols, oils and greases. Attacked by some organic solvents.	GENERAL CHARACTERISTICS
bes, drawn covers and	Same as for ethyl cellulose, particularly for drawn components.	TYPICAL PACKAGING USES
	Tygon, Vinylite sheet.	TRADE NAMES

of sheet generally require much thinner wall thicknesses.

CAST RESINS

CAST PHENOLIC (Cast phenol-formaldehyde resin)	CAST ACRYLIC (Methyl methacrylate cast plate, rods, and tubes)	MATERIAL
 38½	 55 UNITS	RELATIVE
thick sections. Usually in translu-	transparent. Distinctive clarity and	

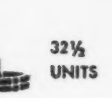
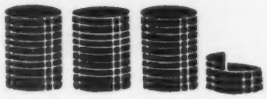
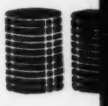
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	(Polystyrene molding materials)	(Cellulose acetate molding material
RELATIVE MATERIAL COST*	 17 UNITS	 32½ UNITS
HOW TO IDENTIFY FINISHED PARTS	Very rigid. Breaks sharply. Glass-like tinkle sound when dropped. Burns moderately slowly with smoky flame and characteristic odor, leaving black, sticky residue. Transparent crystal or light colors usual.	Flexible in thin sections, but n elastic. Dull sound when droppe Burns slowly with characteristic odo Usually in bright opaque or tran parent colors.
GENERAL CHARACTERISTICS	Complete range of fast colors including transparent, with clarity superior to other plastics except acrylic. High luster surface, easily scratched. Extremely high dimensional stability—free from warpage and shrinkage because of no plasticizers and negligible water absorption. Usually considered somewhat brittle, although tensile strength is high. Very little "give" when stressed or shocked. Adequate heat resistance (about 170° F.) for most packaging uses. Virtually complete freedom from taste and odor. Unaffected by all common acids, alkalis and alcohols. Poor resistance to petroleum derivatives and certain essential oils.	Complete range of fast colors i cluding transparent. Fair resistan to scratching. High luster. Fair dimensional stability on e posure to varying humidities b cause of water absorption—tendi to shrinkage because of plasticiz content. Tough and shock-resistant. "Give considerably under stress before bres age. Adequate heat resistance f most packaging uses, although som what lower than other plastics (abo 150° F.). Odor- and taste-free formulatio available. Excellent resistance to oils, greas other petroleum derivatives. Mod ate resistance to acids and alkal Affected by alcohols and derivative
TYPICAL PACKAGING USES	Cosmetic containers, acid bottle closures, crystal boxes for small parts, general purpose injection applications, blown bottles.	Jewel boxes, containers for c products, closures and display co ponents.
TRADE NAMES	Bakelite polystyrene, Chemaco polystyrene, Loalin, Lustron, Styron, Cerex, Plexene.	Chemaco cellulose acetate, Fibest Lumarith, Nixon CA, Plastacele, Te ite I.

* Taking into account price per pound and specific gravity, but not possible differences in fabricating costs.

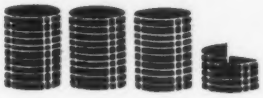
XUM

olding materials)	(Methyl methacrylate molding	(Vinyl chloride-acetate copolymer	(C

g materials)	(Cellulose acetate butyrate molding materials)	(Ethyl cellulose molding materials)	(Me
 32½ UNITS	 33⅓ UNITS	 36 UNITS	
ons, but not hen dropped. teristic odor. ue or trans-	Similar to acetate. Characteristic odor when warm or being molded. Distinctive odor when burned.	Similar to acetate, not readily distinguishable.	Quite than sty dropped slowly. U
st colors in- air resistance ter. bility on ex- midities be- ion—tending of plasticizer ant. "Gives" before break- esistance for though some- lastics (about formulations oils, greases, ives. Moder- and alkalis. derivatives.	Range includes all fast colors but relatively poor in clear transparent. Best in opaque tints. High luster. Good resistance to scratching. Good dimensional stability and resistance to warping and shrinking because of low plasticizer content and low water absorption. Very tough and shock resistant. Heat resistance comparable to acetate. Poor odor and taste characteristics. Excellent resistance to oils, greases, other petroleum derivatives. Good resistance to weak acids and alkalis. Affected by alcohols and derivatives.	Complete range of fast colors, including transparent. High luster. Good dimensional stability—better than acetate, equivalent to acetate butyrate. Low water absorption. Very tough, equivalent to acetate butyrate. Heat resistance adequate, but as low as acetate. Excellent retention of strength and flexibility at sub-zero temperature. Excellent odor and taste characteristics. Excellent resistance to oils, greases, other petroleum derivatives, and to weak and strong alkalis. Moderately resistant to weak acids. Affected by strong acids, alcohols and derivatives.	All col crystal passed b durable l Excelle better th of no pl higher th tate. More f styrene, cellulose resistanc heat-resi Compl taste. Excelle acids. some al oils.
ners for dry display com-	Molded boxes, containers for mechanical parts.	Cigarette boxes, containers to meet low-temperature conditions.	Transp metics, Displays.
ate, Fibestos, astacele, Ten-	Tenite II.	Chemaco ethyl cellulose, Ethocel, Celcon, Nixon EC.	Lucite,

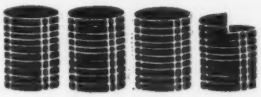
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XUM

olding materials)	(Methyl methacrylate molding materials)	(Vinyl chloride-acetate copolymer molding materials)	(Ca
			
, not readily dis-	Quite rigid, but with more "give" than styrene. Sharper sound when dropped than acetate. Burns very slowly. Usually in crystal transparent.	Flexible but not usually elastic. Dull sound when struck. Will not burn when flame is removed. Distinctive odor when hot. Colored transparents usual.	Very thick cent than depth burn.
f fast colors, in- . High luster. l stability—better lent to acetate r absorption. lent to acetate tance adequate, e. Excellent re- nd flexibility at . d taste charac- to oils, greases, ivatives, and to lis. Moderately ds. Affected by and derivatives.	All colors, most commonly in clear, crystal transparency with unsurpassed brilliance and clarity. More durable luster than styrene. Excellent dimensional stability, better than cellulose plastics because of no plasticizer. Water absorption higher than styrene, lower than acetate. More flexible and less brittle than styrene, although not as tough as cellulose materials. Adequate heat resistance (about 160° F.) with higher heat-resistant formulations available. Complete freedom from odor and taste. Excellent resistance to common acids. Affected by strong alkalis, some alcohols and certain essential oils.	Full range of colors, with slight tendency to yellow on sunlight exposure. Crystal not as brilliant as other injection materials. Excellent dimensional stability because of little or no plasticizer. Low water absorption. Virtual freedom from warping. Very tough and shock resistant, comparable to or better than acetate butyrate. Adequate but low (about 140° F.) heat resistance. Good low-temperature properties. Good odor and taste characteristics. Excellent resistance to oils, greases, acids and alkalis. Good resistance to alcohols.	Colo transl transp plastic Good Goo mode Some ing hu Goo sectio resist colors levels. Exc teristi Exc organi Affect
tainers to meet itions.	Transparent molded boxes for cosmetics, jewelry and small products. Displays.	Molded containers to meet rough, varying service conditions.	Disp
ulose, Ethocel,	Lucite, Plexiglas.	Vinylite, Chemaco, Tygon.	Bak Crystl

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XUM

(Cast phenol-formaldehyde resin)	(Methyl methacrylate cast plate, rods, and tubes)	
		RELATIVE MATERIAL COST
Very rigid and hard. Usually in thick sections. Usually in translucent and transparent colors other than crystal. Distinctive luster and depth of color. Chars but does not burn.	Very rigid. Usually in crystal transparent. Distinctive clarity and brilliance. Usually in sections not thinner than 0.030 inches. Burns very slowly.	HOW TO IDENTIFY FINISHED PARTS
Colors include all transparent, translucent and opaque. Crystal transparent not as brilliant as thermoplastic. Tendency to yellow on aging. Good resistance to scratching. Good dimensional stability and moderately low water absorption. Some tendency to crack under varying humidities. Good mechanical properties in thick sections. Fair shock resistance. Heat resistance good (about 175° F.); discolors but does not flow at higher levels. Excellent odor and taste characteristics. Excellent resistance to oils, greases, organic solvents and weak acids. Affected by alkalis.	Unsurpassed brilliance and clarity in crystal and colored transparent (light fast). Moderate resistance to scratching. Excellent dimensional stability. No plasticizer, very low water absorption. Good strength properties; shock resistance not as high as cellulose or vinyl materials. Heat resistance low but adequate, with heat-resistant formulations available. Excellent odor and taste characteristics. Excellent resistance to common acids, alkalis and alcohols. Affected by organic solvents, petroleum derivatives.	GENERAL CHARACTERISTICS
Display components.	Displays, luxury boxes.	TYPICAL PACKAGING USES
Bakelite cast resins, Catalin, Crystle, Marblette, Prystal.	Lucite, Plexiglas.	TRADE NAMES

XUM

Molded containers

by W. B. Petzold

One of the important advantages of molded plastics containers is their happy faculty for combining glamor and utility. The packager will find at his disposal a wide variety of materials which may be used singly or in combination, to provide almost any desired effect or service.

He will find a working knowledge of plastics materials and manufacturing methods a great help in obtaining exactly the type of plastics package that will best suit the needs of his product. (See *Plastic Materials Used in Packaging*, p. 433, and *Manufacturing Processes*, p. 437.)

We can assume that in every case a primary consideration of the packager is that the container be attractive, unusual and eye-catching—something that will help to sell his product. Beyond this consideration there are two major factors that enter into the selection of a molded plastic container: first and foremost, the demands that will be placed upon it, and a secondary factor sometimes equally important—its cost. It is the problem of the package designer to achieve the first consideration within the limits of the other two—that is, to design a package that is attractive, yet is economical and will adequately protect its contents.

Materials for molded containers

For any particular packaging application, the general characteristics of the various plastics materials may narrow the choice of material or molding method. Although such general characteristics are discussed in the article on page 433, it might be of value to mention here the appearance and special properties of finished molded containers made from the various plastic materials, with an attempt to explain how such factors determine which plastics are customarily used for packaging certain product lines.

The *thermosetting* materials (particularly phenolics and ureas) have for some time been generally considered the best adapted for most types of molded container, although with recent improvements in the thermoplastic field this is not always true.

Molded phenol-formaldehyde containers have excellent impact strength and stability and are resistant to heat and moisture. Colors—except brown, black and dark shades of red—are unstable and will bleach or will darken with prolonged exposure to sunlight. This factor forbids the use of phenolics, except in the colors cited, in packages that are to be used in store window displays.

Phenol-furfural has some characteristics similar to those of phenol-formaldehyde, but is often used in transfer molding applications to effect production economies. Generally speaking, a phenolic is recommended for molded containers, unless color choice or quality of the finish outweigh consideration of the total cost.

The urea-formaldehydes produce strong, lightweight molded containers in a full range of colors. Color stability is excellent, and molded urea packaging items may be obtained in varying degrees of translucency, though not in transparent. When black is the chosen color, urea containers have an attractive glossy finish and a good wearing surface.

Writing and drawing implements, watches, rings, manicuring sets, razor sets and cutlery are among the

1—Rouge case in two pieces has a plastic hinge. The decoration is effected by gold-leaf stamping.

PHOTO, COURTESY BERNARD EDWARDS



2—Plastics are used in cosmetic containers for purse or bureau. These are molded from styrene.

PHOTO, COURTESY MONSANTO CHEMICAL CO.

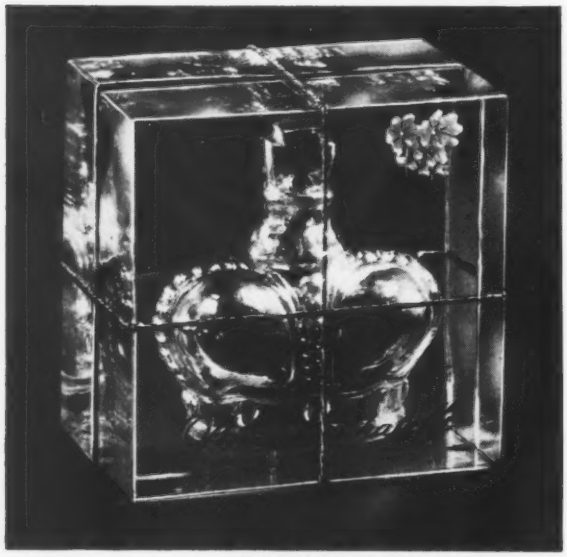


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PHOTO, COURTESY TECH-ART PLASTICS CO.

3—Beauty kit and containers are compression molded of urea, decorated by the silk screen process.



PHOTO, COURTESY E. I. DU PONT DE NEMOURS & CO., INC.

4—Matchabelli's crown bottle is encased in injection-molded acrylic cube with an embossed nosegay.



PHOTO, COURTESY OWENS-ILLINOIS GLASS CO.

5—Phenolic vials, resistant to moisture, chlorine and iodine, protect water purification tablets.

products that may be attractively and economically packaged in containers of thermosetting plastics. These molded containers are also used extensively in the cosmetics field. In this field, glass or metal liners are often used with liquid or semiliquid preparations to prevent any odor of the plastic from tainting the product it packages.

The *thermoplastic* materials are ideally suited to speedy mass production, with resultant manufacturing economies. Molded thermoplastic containers are strong and have good impact resistance. While the limited moisture resistance of thermoplastics (with the exception of polystyrene) restricts their use in certain types of molded containers, they are in wide use, especially in the jewelry and cosmetics fields. These containers may be made in a full range of stable colors and in all degrees of transparency, including clear—a distinct advantage in the field of display packaging. However, containers molded of the thermoplastics should not be enclosed in display cases or windows where the temperature may rise beyond the heat-resistance point of the material, frequently causing the package to become warped or distorted.

Cellulose acetate, the acrylics and the styrenes are the thermoplastic materials most commonly employed in molded packaging components.

Cellulose acetate is a strong, tough material, which molds with great speed and ease. It provides strong, durable, thin-walled containers in opaque colors and varying degrees of transparency. Its clarity, however, does not equal that of the styrenes or the acrylics, though it is sometimes used in transparent applications to effect cost savings.

The acrylic resins have fine moldability and a crystal clarity which makes them ideally adaptable to all types of containers where it is desirable to display merchandise within its package. Acrylic containers are structurally stronger than those of cellulose acetate and are more resistant to wear, but they are apt to be scratched and marred by handling. They are light in weight (about half the weight of similar glass containers), and resist moisture and weak alkalis to a limited degree. One restricting factor on their more widespread use at this time is their comparatively high cost (approximately double that of cellulose acetate).

Polystyrene is among the most promising of all the thermoplastic materials, from the standpoint of molded containers. It is quite possible that if raw material manufacturers are able to reduce further the costs of both materials, styrene will share most thermoplastic molded packaging with acrylic. Styrene possesses many of the desirabe qualities of acrylic, some to an improved degree. Containers molded of some styrenes are almost impervious to moisture and exceptionally acid resistant. Rapid strides were made during the war in improving molding materials and techniques, but polystyrene still presents many molding problems not encountered when molding other materials of the thermoplastic group.

Cosmetics (such as cream rouge), jewelry and drugs



PHOTOS 6, 7 AND 12, COURTESY TENNESSEE EASTMAN CORP.

6—Cellulose acetate butyrate shaving case with compartments will be used for life of the razor.



7—Men's toiletries, like women's cosmetics, have more sales appeal if packaged in colorful plastics.

are among the products best adapted to packaging in molded thermoplastics, particularly in the attractive transparent containers.

Many other plastic compounds have been employed in molded containers with varying degrees of success, but a discussion of their characteristics at this point would prove of little value. Somewhere in the two groups of materials listed will be found a plastic that can do almost any type of molded container job economically and well.

However, it is important that the right plastic material be selected to meet the specifications of the task at hand, if the molded container is to be satisfactory to the packager and the consumer. For instance, plastics for lipsticks and other cosmetics containers must be carefully chosen to avoid certain difficulties such as warping, sweating or unpleasant odor.

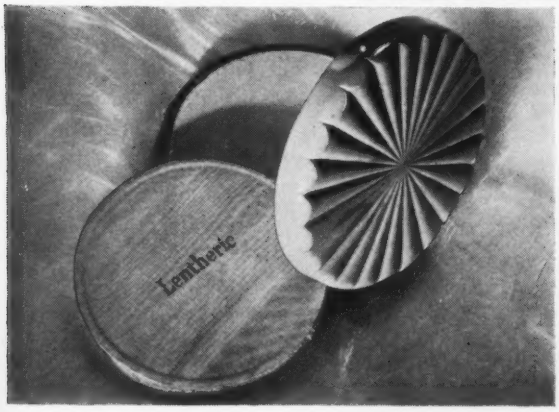
As in all fields of manufacture, a certain amount of inferior plastics materials were of necessity produced and used during wartime scarcity. Other plastics were pressed into service in unsuitable applications. But molders feel sure that with proper selection of materials and proper design it will be possible to eliminate all complaints caused by these factors.

Designing molded containers

Beyond the choice of a material, there are a number of design considerations which will have great bearing upon the production of a successful molded package.

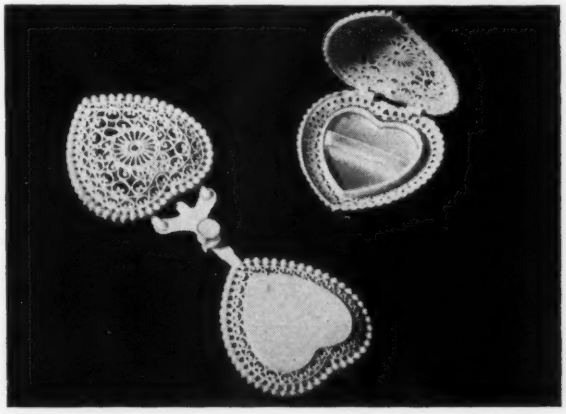
8—The fluted torquoise cover and the black base of this face powder compact are both of plastic.

PHOTO, COURTESY LENTHERIC, INC.

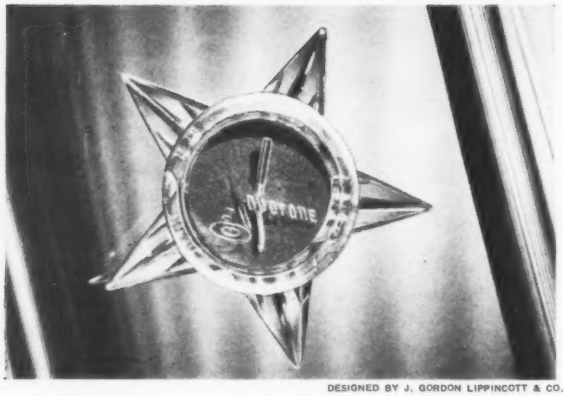


9—Molded cellulose acetate simulates appearance of carved ivory in dainty heart-shaped ring box.

PHOTO, COURTESY FOSTER-GRANT CO., INC.

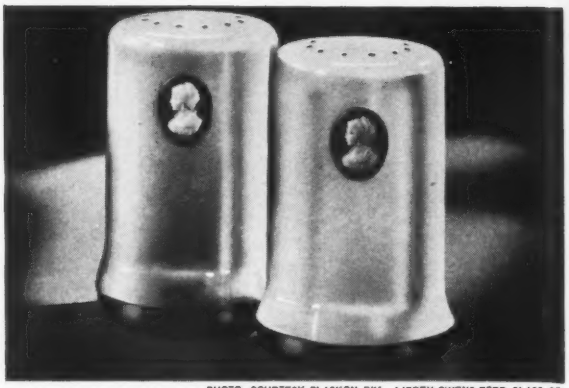


XUM



DESIGNED BY J. GORDON LIPPINCOTT & CO.

10—Trade name of Star Sapphire phonograph needle is emphasized by shape, sparkle of styrene package.



PHOTO, COURTESY PLASKON DIV., LIBBEY-OWENS-FORD GLASS CO.

11—Urea has long been used in such applications as re-use containers for many household cleansers.

(For a more detailed discussion of this subject, see *Design Suggestions for Molded Parts*, p. 454.)

The present design trend is toward combining other materials with plastics or combining two or more plastics in a single unit. By such methods it is possible to achieve effects beyond those possible when only one material is used.

Plastics, like all other materials, have certain shortcomings, and it is sound design to allay these faults where possible. A combination of plastic with metal, or with another plastic, may result in a package that is stronger and at the same time has increased aesthetic appeal.

The use of metals to give structural support to the colorful thermoplastics has considerably expanded the field in which thermoplastic containers can be safely used. Metal bands may often be incorporated in the design to hide or reinforce joints and at the same time to contribute to the over-all appearance of the product by affording a sharp contrast with the warm texture typical of the plastic.

Where it is desired to obtain the advantage of clarity and at the same time to retain rigidity in the molded package, as, for example, in a watch case, the solution may be to use a hinged or friction-type thermoplastic top and a base of some thermosetting material. To carry the example even further, it might prove advisable to join the two parts with either a metal band or with a clip.

Merchandising value

From a merchandising angle, molded plastics offer the packager the most modern container available. A public that has become definitely plastics conscious through the advent of these materials into every phase of daily living, looks upon the plastic package as a mark of a product that is abreast of the times. This is an important sales factor, as any retailer knows.

For items that are sold in the premium field, molded plastics offer an added incentive to buy, by providing a double-use package which, after serving its original purpose as a sales container, can be converted to other useful or decorative purposes.

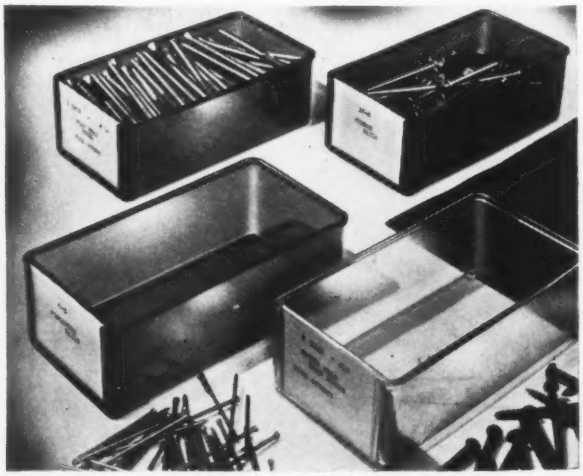
12—Oiler and sprayer is a combination of a tough cellulose acetate butyrate barrel with metal top.

Columbus Plastic Prods. Co.



13—Injection molded of transparent cellulose acetate, tote box has groove at end for data card.

PHOTO, COURTESY S. S. WHITE DENTAL MFG. CO.



Fabricated containers

by William F. Cullom

The use of millions of transparent, semi-rigid fabricated containers by the armed forces during the war is testimony to the effectiveness of this type of container for packing a variety of goods. The wartime tasks of such packages were specific: to conserve weight; to permit rapid and economical production; to make possible speedier distribution by permitting quick identification of contents; to protect against grease, water and other natural elements; and to guard against the various hazards of shipping.

The needs of peacetime packagers are identical—with one additional requirement: their packages must feature glamor, which was of no importance to the Army. The glamor of transparent fabricated plastic containers is without question responsible for some of the most successful merchandising of the last decade.

In considering these containers it might be well to review the materials best suited for them, together with the three basic types of fabricated plastic containers, which are the drawn, the set-up and the spiral, and their respective advantages.

Materials

The two principal materials used are cellulose acetate and ethyl cellulose, in clear transparents and tints, although for containers of this type any semi-rigid transparent plastic sheets in thickness between 0.005 in. and 0.020 in. can be used. In actual practice, cellulose acetate is the preferred material for general use. However, because ethyl cellulose is slightly tougher, though less rigid, it is frequently selected for the more difficult drawn containers.

Vinyl copolymers are being used to a certain limited extent and it is to be expected that their volume as well as that of ethyl cellulose will increase for specialized applications. Although transparency is favored, colored opaque sheeting is sometimes used.

The drawn container

Drawing consists basically of transforming a two-dimensional sheet into a three-dimensional form by means of dies in a drawing press, under heat and pressure. It is important to note that sufficient material flow takes place in drawing so that the wall thickness of the finished piece is uniform and approximately that of the original stock.

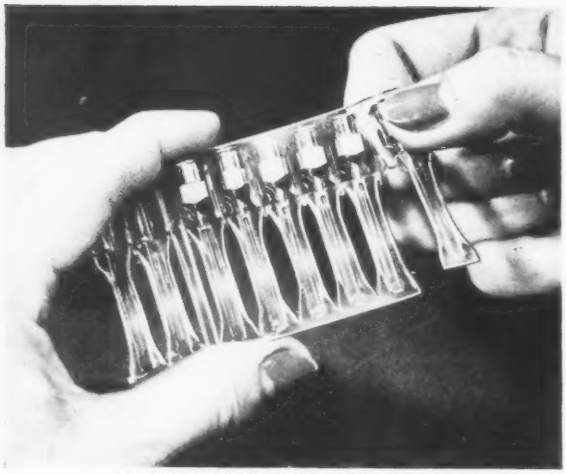
Shapes made by this process are frequently used as shallow lids for containers made by other means. Other, deeper drawn pieces are used as cosmetic containers and powder puff boxes. Very frequently, drawn parts are used in combination with other materials, as, for example, a drawn transparent lid for a cardboard tube or cardboard box.

Until recently, the standard method of drawing was

PHOTO, COURTESY MIRO CONTAINER CO., INC.



1—Grosset & Dunlap package deluxe editions of children's classics in acetate slipcases with features which appeal to both retailers and consumers. The fabricated rectangular sleeves enhance the books for display purposes, and the printing on the transparent case makes it possible for the illustration to appear on the cover exactly as the artist conceived it. Parents will appreciate its easy-to-clean protectiveness.



MATERIAL BY CELANESE PLASTICS CORP., FABRICATED BY DESIGN CENTER, INC.

2—Hypodermic needles in slit and drawn acetate strips. Individual channels are $^1/_8$ in. deep.



PHOTO, COURTESY LACTONA, INC.

3—Drawn containers for brushes. The toothbrush package is sterile, and scored for easy opening.



PHOTO, COURTESY SHOWBOX DIV., CENTRAL STATES PAPER & BAG CO.

4—Dramatic seasonal merchandising—Southern Comfort in imprinted cylindrical rigid container.

to hand-feed precut blanks into a heated drawing die, mounted in a hand press, a kick press or a power press. If the plastic was medium or heavy gauge, the blanks needed preheating. Usually the cutoff was incorporated in the drawing die, but sometimes it was accomplished in a subsequent operation. By this method the average production rate was approximately 8–10 pieces per minute.

During the war, a high-speed automatic drawing press for cylindrical containers was developed.[1] A battery of these new cam presses has been in operation for more than two years. They are fully automatic, feeding reels of plastic sheeting over preheated plates to heated dies. The production rate, which at present is 50–90 drawn pieces per minute, is expected to be increased. New methods of drawing, not limited to circular containers, are also being developed.

The set-up container

The set-up container may be entirely of transparent plastic, or may be a combination of plastic with some other material. Construction is not difficult. This type of container is available in forms of box, cylinder and a variety of other shapes, and is suitable for use with almost any product that can profit by visual display.

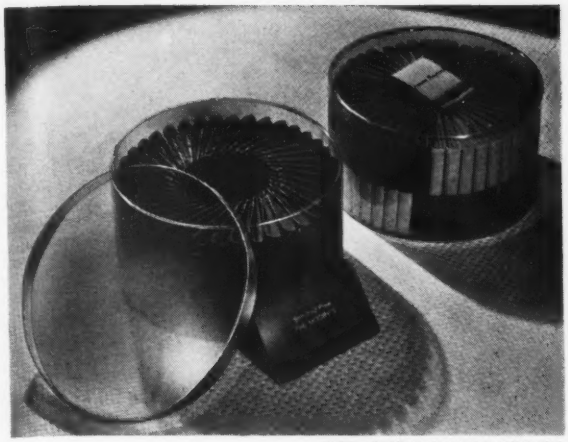
To construct a transparent plastic set-up box, blanks are die-cut and then creased with a heated creasing bar or die. The creased blanks are next folded around a mandrel and cemented by hand. The only pieces of equipment needed are a hand press or a power press for blanking and creasing, and a cementing mandrel. One machinery manufacturer, however, offers a semiautomatic creaser that is considered to be more efficient, and offers greater speed, than the press creasing operation. Several machinery companies are reportedly working on semiautomatic or fully automatic equipment to produce set-up boxes.

One of the oldest and simplest forms of the fabricated or set-up type of package is the seamed cylindrical container. This type of transparent package is popular for powder puffs, candy and dozens of other items. The construction is completed in four simple steps. First, a blank of the correct size is wrapped around a mandrel, where the overlapped edge is cemented with a solvent. The top and bottom of the resulting cylinder are then beaded by means of a heated beading die. Next, a die-cut disk of plastic or cardboard is added (and sometimes cemented to the bottom bead). Recently, equipment has been developed to perform these operations automatically. Finally, a drawn transparent plastic cover is used as a closure.

Beading equipment

Automatic continuous straight-edge beading equipment has now made possible the development of an inexpensive type of set-up box, the fabrication of which

[1] See "Automatic Drawing", MODERN PACKAGING XVIII, No. 8, 94 (April, 1945).



PHOTO, COURTESY CELANESE PLASTICS CORP.

5—Circular match containers, beaded at both ends, have cemented cardboard bottoms and drawn covers.



MATERIAL BY MONSANTO CHEMICAL CO., FABRICATED BY GEORGE V. CLARK CO., INC.

6—Rigid transparent containers with metal tops and bottoms protect tea bags from dust, handling.

lends itself easily to quality production methods. In this method, one or both edges of a strip of the proper gauge and width of plastic sheet are run through a straight-edge beader. The strips are then creased across the beads into the desired shape of the side walls of the container—cylinder, rectangle, cone, heart, bell or other shape—and cemented.

The following step is to have a bottom die-cut to exact size. While it can be made of plastic, this bottom piece is frequently of rigid cardboard since there would be no advantage in using a transparent bottom. The piece, which fits tightly, is pushed into position by hand and is supported by the bottom bead on the side wall. It may or may not be cemented. The cover, if it is not of a drawn construction, can be made exactly the same way, except that the die-cut piece is always transparent and the lower edge of the lip is usually left unbeaded.

Beading—A smooth, round beaded edge can also be applied to cylindrical containers, whether they be spiral or convolute wound, and to drawn covers of drawn containers. This is done by means of a heated beading die. Semiautomatic and fully automatic machines have been designed and built, and at least one packaging machinery manufacturer offers a standard model to be used for this purpose.

It might be pointed out that, in addition to the decorative finish beading provides, there are two specific benefits to be derived from it: in the first place, beading gives strength and rigidity to the container; secondly, its smooth finish guards against the snagging of merchandise contained within it, as for example, hose, fabrics, yarn or wool.

The spiral package

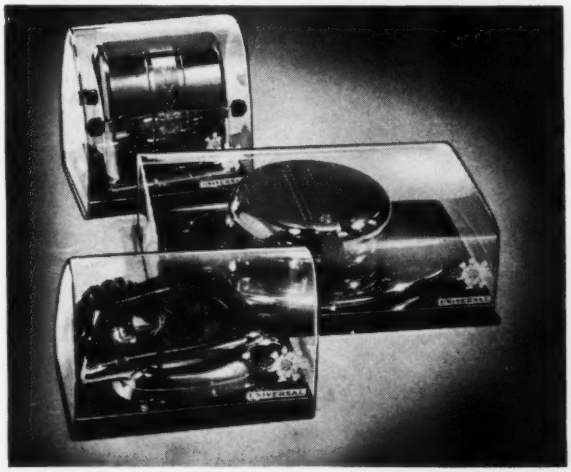
The transparent plastic spiral container was one of the developments of the war. In principle, its construction is similar to that of the ordinary spirally wound soda straw. Plastic spiral tubes, however, come in a variety of plies. One may be a single-ply tube, wound so that there is a slight overlapping which is automatically cemented. Another may be made up of from two to five plies, so wound that the center of each succeeding ply is directly over the butted joints of the previous ply, resulting in an extremely rigid, tough tube. Joined in this way, two plies of 0.005 in. are stronger than a single ply of 0.010 in., and four plies of 0.005 in. are much stronger than two plies of 0.010 inch.

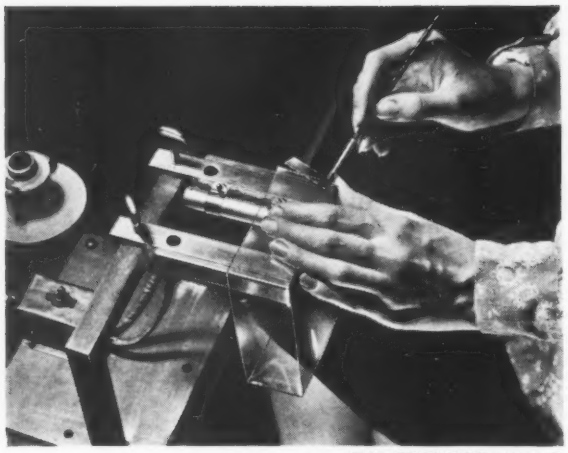
Most spiral packages use a cylindrical tube shape. One producer, however, offers a variety of rectangular shapes.

Among the advantages of the spiral container is its ease of manufacture. It is produced in continuous lengths, at great speed, in a variety of diameters, on machinery easily adapted from winding paper tubes or soda straws. A traveling automatic cutoff knife, adjusted to production speed, cuts lengths desired, permitting uninterrupted production. Spiral packages are essentially functional, rather than decorative. While they

7—Glamorous presentation of household items packaged in shaped, transparent display containers.

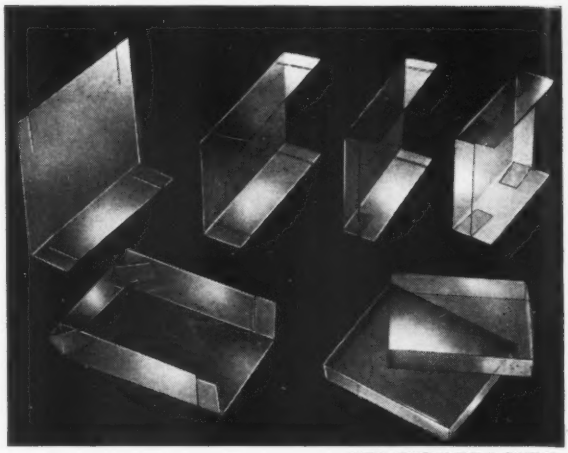
PHOTO, COURTESY MONSANTO CHEMICAL CO.





PHOTO, COURTESY EASTMAN KODAK CO.

8—Heated bars support fabricated box as edges are joined by quick-setting transparent adhesive.



PHOTO, COURTESY JOHN H. OXLEY CO.

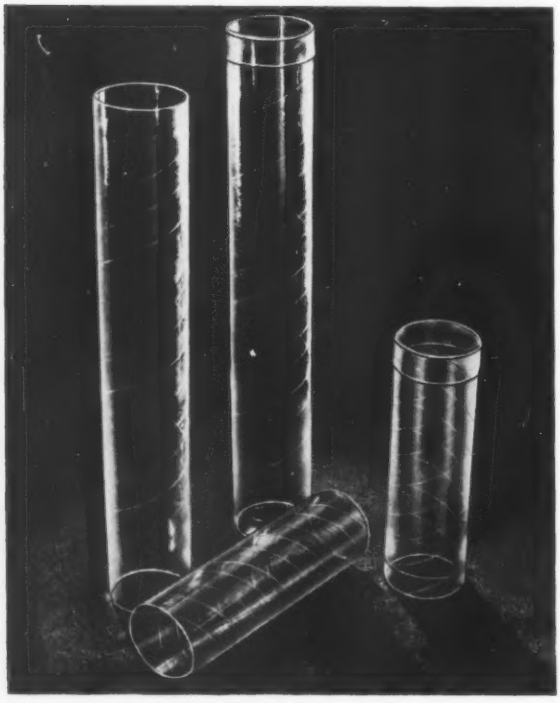
9—Flat die-cut plastic sheets are folded so that material supports itself—no cementing necessary.

do not have the clear transparency of the other two types, they do provide good visibility and are well suited to applications where protection, identification and light weight are the principal requirements.

The war served as a severe proving ground, for millions of spiral containers were shipped all over the world. Now, similar containers, in varying diameters and thicknesses, will hold screws, bolts, nuts, toothbrushes, points, carburetor parts, watch parts, paint brushes, drafting instruments, typewriter ribbons, small machine parts, welding rods and hundreds of other articles.

10—These spiral-wound ethyl cellulose containers have drawn ends. The bases are cemented to them.

PHOTO, COURTESY THE DOW CHEMICAL CO.



These, then, are the three basic types of fabricated transparent plastic containers. By making himself familiar with their characteristics and by working with material supplier and fabricator, the designer or user of packages can select a container that will provide the protection, utility and sales appeal which he desires for the specific product.

The plastic sheet materials may be printed or decorated by any of a number of methods, including letterpress, lithography, rotogravure, silk screen, roll-leaf stamping and embossing. (See *Decoration of Plastics*, p. 457.)

Trends in fabricated containers

Originally, it was predicted that fabricated transparent containers would find greatest use in the packaging of luxury goods. This was predicated on the relatively high cost of the materials and the hand-made boxes. The first packages of this type reaching the market were, in fact, for luxury items—flowers, cosmetics and liquor.

However, the prospects for transparent fabricated plastic containers are extremely favorable. An inexpensive method of producing sheeting by extrusion,[2] as well as the current work on the development of automatic fabricating machinery, is reducing the cost of such containers. The luxury market is retained, but low-priced merchandise, too, now appears in transparent boxes. Tobacco, candy, medium-priced textiles, costume jewelry and bakery products are typical of the items which are utilizing these packages.

The problem at the present time is one of supplying the large demands for stock from 0.005 in. to 0.020 inch. However, expansion, already projected by several leading companies, will meet the needs of the retail industry, which is well aware of the great merchandising value of transparency.

[2] See "Low-cost Plastic Sheet," MODERN PACKAGING XIX, No. 9, 110 (May, 1946).

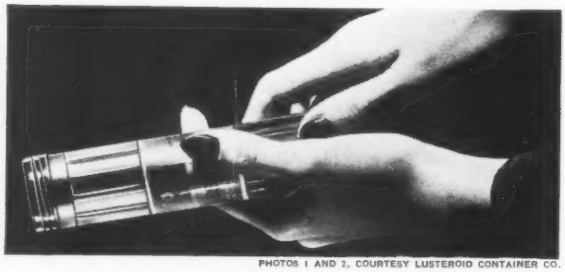
PROPERTIES OF PLASTIC SHEETING USED FOR RIGID TRANSPARENT CONTAINERS*

Properties	*Vinylite*	*Ethocel No. 610*	*Eastman Acetate*	*Lumarith*	*Vuepak*
GENERAL INFORMATION					
MANUFACTURER	Bakelite Corp., New York, N. Y.	Dow Chemical Co., Midland, Mich.	Eastman Kodak Co., Rochester, N. Y.	Celanese Plastics Corp., New York, N. Y.	Monsanto Chemical Co., Springfield 2, Mass.
CHEMICAL TYPE	Vinyl chloride-acetate resin	Ethyl cellulose	Cellulose acetate	Cellulose acetate	Cellulose acetate
FORMS AVAILABLE	Sheets 50 by 20 in.	Sheets and continuous rolls	Sheets and continuous rolls	Sheets and continuous rolls	Sheets and continuous rolls
THICKNESS RANGE, IN.	0.005 to 0.250 by 0.005 steps	0.003 to 0.020	0.003 to 0.020	0.003 to 0.020	0.005 to 0.020
AREA FACTOR FOR 0.005-IN. GAUGE, SQ. IN. PER LB.	4,000	4,800	4,250–4,350	4,100–4,200	4,189
MAXIMUM WIDTH OF CONTINUOUS ROLLS, IN.	.....	29	40	42	32
SPECIFIC GRAVITY AT 25° C.	1.33–1.45	1.14	1.28–1.31	1.32–1.30	1.25–1.30
MECHANICAL PROPERTIES					
TENSILE STRENGTH, LB. PER SQ. IN.	8,000–10,000	8,000–10,000	9,000–13,000	6,500–11,000	7,000–11,000
ELONGATION, %	5	25–35	30–45	25–40	25–50
BURSTING STRENGTH (MULLEN TEST), LB. PER SQ. IN.	.....	112 for 0.003-in. gauge	90 for 0.003-in. gauge	290 for 0.010-in. gauge	150–350
TEARING STRENGTH (ELMENDORF), GRAMS PER MIL	5.6	97 for 0.003-in. gauge	8–20 for 0.003–0.020-in. gauge	16.5	11–26
FOLDING ENDURANCE (M. I. T.), CYCLES	.....	40–150 for 0.020–0.003-in. gauge	.....	10 for 0.010-in. gauge	8–56 for 0.010 to 0.003-in. gauge
THERMAL PROPERTIES					
COEFFICIENT OF EXPANSION, 10^{-5} PER ° F.	3.9 (32° to 120° F.)	6 (15° to 110° F.)	.....	6–9	5.6–8.9
THERMAL CONDUCTIVITY, 10^{-4} CAL. PER SEC. CM. ° C.	3.7	5.6	.....	4.5–7.8	4.5–7.8
HEAT DISTORTION POINT, ° F.	135–155	130–220	.....	.....	130–212
FORMING TEMPERATURE, ° F.	195–265	0–275	225–300	225–275	225–275
CHEMICAL PROPERTIES					
WATER ABSORPTION, % IN 24-HR. IMMERSION AT 25° C.	0.05–0.15	2.6	5.5–7.0	4	1.5–3.0
DIMENSIONAL CHANGE AFTER 24-HR. IMMERSION IN WATER, %	0.05 (6 weeks)	1.0	0.3–2.5	0.75–1.0	0.8
LOSS IN WEIGHT AFTER 24-HR. IMMERSION IN WATER, %	None	None	1.0–6.0	0.15	Nil to 0.2
WATER-VAPOR PERMEABILITY (0% TO 100% R. H.) G./M.²/24 HR.	30 @ 30° C. for 1 mil film	200 @ 30° C. for 0.010-in. gauge	180 @ 37.5° C. for 0.010-in. gauge (0% to 90% R. H.)	75 @ 25° C. for 0.010-in. gauge	50–145 @ 25° C.
RESISTANCE TO WEAK ACIDS	Excellent	Excellent	Gradual hydrolysis	Fair	Fair
RESISTANCE TO STRONG ACIDS	Excellent	Decomposes	Decomposes	Decomposes	Decomposes
RESISTANCE TO WEAK ALKALIS	Excellent	Excellent	Gradual hydrolysis	Fair	Slight attack
RESISTANCE TO STRONG ALKALIS	Excellent	Excellent	Decomposes	Decomposes	Decomposes
RESISTANCE TO GREASES AND OILS	Excellent	Excellent	Fair	Depends on type	Varies with type of grease or oil
RESISTANCE TO ORGANIC SOLVENTS	Resistant to alcohols; soluble in ketones and esters; swells in aromatic hydrocarbons	Soluble in most common solvents	Softens in alcohols; soluble in acetone, methyl acetate; insoluble in hydrocarbons	Softens in alcohols; soluble in ketones and esters; insoluble in hydrocarbons	Softens in alcohols; soluble in ketones and esters; insoluble in hydrocarbons
PERMANENCE PROPERTIES					
RESISTANCE TO LIGHT UNDER INDOOR CONDITIONS	Slight yellowing after prolonged exposure	Good	Good	Good	Good
RESISTANCE TO LOW TEMPERATURES	Flexibility decreases	Excellent at −50° F.	Good	Satisfactory	Satisfactory at 32° F.
RESISTANCE TO HIGH RELATIVE HUMIDITY	Excellent	Slight swelling	0.4% expansion @ 20% to 70% R. H.	Swells	Swells
FLAMMABILITY CLASSIFICATION	Nonflammable	Slow burning	Slow burning to nonflammable	Slow burning	Slow burning

* From manufacturers' figures and data.

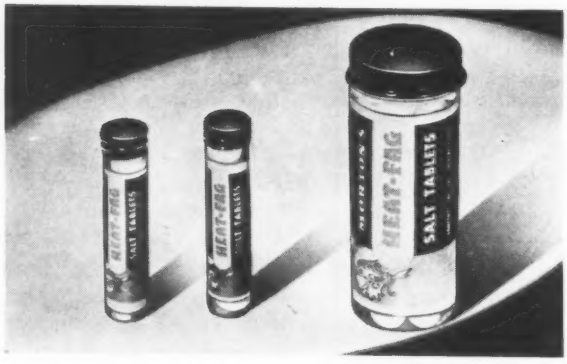
Semi-rigid seamless vials

by Richard H. Davis



PHOTOS 1 AND 2, COURTESY LUSTEROID CONTAINER CO.

1—Files are both protected and displayed in this transparent container with a threaded metal closure.



2—Packaged in lightweight vials, salt tablets for summer days are easy to carry in pocket or purse.



PHOTO, COURTESY CELLUPLASTIC CORP.

3—Pressure on semi-rigid walls of oil can releases drop of lubricant. Transparency warns of low supply.

Packaging in seamless plastic vials and tubes is ideal for protecting and merchandising a wide variety of products. The sanitary qualities appeal to manufacturers of pharmaceuticals, drug sundries, cosmetics and dental and surgical supplies. In the industrial field, such products as files, bits, diamond drills, precision gauges, taps and dies are being packaged in this manner, not only for the protection afforded before the sale, but also for the safe storage provided after purchase of the item they protect.

For consumer items, transparent containers offer a twofold merchandising appeal, for they show off the product to advantage and afford a practical container for consumer re-use.

Cellulosics, chiefly cellulose acetate, are the plastics used, for they possess especially suitable properties. Although feather-light in weight, cellulosic vials and tubes are strong, rigid and inherently shatterproof. They provide adequate protection to their contents in handling, in transit, on the shelf and during use.

From a merchandising standpoint, packaging in these plastic containers offers distinct advantages. These seamless vials and tubes can be produced in all colors of the rainbow, clear or opaque, to meet the specifications laid down by packaging specialists. When transparent vials are used, their crystal-clear walls provide the product visibility that is so essential in today's selling pattern.

In addition, the use of this particular packaging medium makes it possible to print the label in one or more colors as an integral part of the container, thus assuring permanent identification of the product and at the same time effecting a saving in labeling expense by eliminating the necessity of affixing paper labels, which would require an extra step.

One of the most significant benefits of this type of packaging is its economy. In addition to the elimination of the expense of affixing labels, plastic vials and tubes reduce handling and shipping costs through their combination of light weight and durability. No protective packing or partitioning is required. This saves time, labor and material. It is interesting to note that many users report that this saving quickly amortizes the cost of the complete packaging program of a company adopting this type of container.

Seamless plastic containers are available in standard diameters from $^1/_4$ in. to $1^1/_2$ in. and in lengths as great as 6–9 inches. For special requirements other sizes are obtainable.

Puffers and molded nozzles are available for use as applicators with containers of this type. As for closures, standard types supplied include cork, slip-on and screw-cap, to meet varying needs of the many products packaged in semi-rigid vials.

XUM

Molded closures

The history of plastics in the closure field started in the middle 1920's, when phenolics began to replace expensive imported tin closures for use on collapsible tubes. Repeal of the prohibition amendment provided an additional large market for plastic closures after odorless and colorfast compounds had been developed. In the 20 years of their use, plastic closures have become a billion-dollar-a-year industry.

The smooth warm feel, the rich built-in colors, the permanently sanitary appearance and the infinite variety of design possibilities are among the most important factors which have led to the widespread use of plastic closures for drug and cosmetic containers which must be opened and closed a number of times. Particularly in the cosmetic field, the higher cost of plastics in comparison to other standard closures is justified by their richer appearance and their greater variety of shapes, since the success of a cosmetic product depends largely upon the attractive appearance of its container.

Many varieties of closure are possible with plastics. The screw type predominates, but lug closures have also been successful. Plastic caps may be used on collapsible tubes, bottles or wide-mouth jars, such as those used for cold creams. They screw smoothly onto containers made of plastics, glass or metal. Six standard sizes of collapsible tube caps are available. The Glass Container Association has also standardized closure sizes, thus simplifying change-over from one closure to another.

Special types of caps available include droppers, shakers, daubers and other forms of applicators and dispensing devices. (See also the articles beginning on p. 371 and p. 376.

Materials

The choice of closure material, including the initial decision whether to use plastics as well as the selection of the particular plastic, depends in any given case upon the product to be packed, the allowable closure cost and the decorative effect desired.

Most closures are made of the thermosetting plastics. Phenol-formaldehyde materials, supplied in black, brown and a limited range of opaque colors, are standard for the less glamorous containers, where utility is more important than color. Except for the brownish shade of the resin, which limits color, phenolics are superior to other plastic closure materials because they are cheaper, easier to mold and have good resistance to heat.

When a cap is made of a new phenolic compound, initial tests must be made for fading in sunlight and to determine whether the material bleeds when in contact with the product to be packed. In testing, the molded sample is usually half immersed in the product and half exposed to air in order that results will also show the effect of oxidation.

Urea, second in quantity among plastics used for closures, is colorless, and combined with white cellulose gives water-white, translucent products. By proper choice of pigments, a broad range of lightfast colors from palest pastels to deep chromes can be obtained. Melamine closures have similar advantages, but are more costly, and therefore are less often used except when their superior water resistance is required in the finished closure.

Although thermoplastics offer an unlimited range of translucent and opaque colors, their use in the closure field is limited by lack of an all-purpose material. A thorough laboratory check is customarily made when using any thermoplastic material for a closure. These tests cover every new run of caps as well as every new batch of the product to be packed.

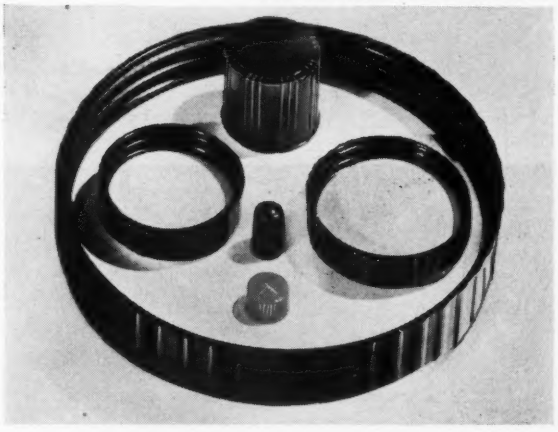
The cellulosic thermoplastics are not suitable for closures because they tend to swell under conditions of high humidity, which would decrease the inner diameter of the caps, preventing their removal from the containers or at least making it difficult.

Polystyrene is the most commonly used thermoplastic closure material because of its relatively low cost, high softening temperature and good chemical resistance. For the last reason it has been used to cap containers for some types of acid and certain cosmetics. Its use may be expected to increase within the next few years. However, one limitation upon its application is the fact that it is attacked by most essential oils.

The superior chemical resistance of polyethylene may increase its use for special-purpose molded closures as

1—Plastic closures are available in a wide range of sizes, depending upon whether they are to be used on wide-mouth jars, ordinary bottles or tiny tubes.

PHOTOS 1 AND 2, COURTESY OWENS-ILLINOIS GLASS CO.



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well as liners, as the material becomes better known.

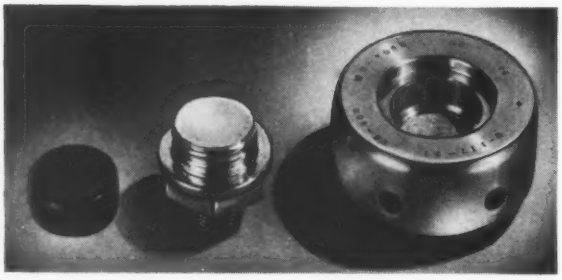
More complete information on the characteristics of the various materials may be found in *Plastics Materials Used in Packaging*, p. 433. But in any case, the choice of material from which the closure is to be made should be arrived at jointly by the customer and the closure manufacturer, so that all factors pertaining to the use of the closure as well as the advantages and limitations of all available materials may be considered before making the final decision.

Molding closures

The most common method of molding closures is by the compression process. In this method, a thermosetting molding powder is placed in a hot steel cavity which duplicates the dimensions and the shape in reverse of the closure exterior surface. A hot chromium-plated steel plug carrying the dimensions and contour of the inner surface of the closure is forced into the molding powder in the cavity. Male and female mold halves close, preventing loss of material from the mold except for minimum flash allowance. Flow of the material fills the space between the mold halves and thus fixes the shape of the closure to that of the mold. The mold may then be opened and the closure removed while hot. If it is a screw type, it must be unscrewed from the plug. Subsequent cooling, removal of flash, inspection, insertion of liner, final inspection and packing complete the operations in the production of a typical closure.

In the case of thermoplastic closures, injection molding is usually employed. In either case, multiple-cavity molds are the rule, so that machine output is at an economically high rate. The number of impressions made from one mold depends upon the size of the cap and the pressure developed by the particular machine. The multiple cavities may be cut from the same mold block. However in the case of the rotary compression molding, there are a number of blocks, each carrying a single cavity, while above there is another series of blocks, each carrying a force plug. (See *Manufacturing Processes*, p. 437, for illustrations and additional data concerning the specialized molding processes used for closures.)

2—Steel mold cavity at right determines shape and design of this compression molded cap; plug half of mold, shown in center, produces inner screw threads.



Liners

After the closure has been made, it is necessary that it be fitted with a liner, the function of which is to seal off the opening and prevent leaks. It may be a one-material disk or ring—of rubber, cork, felt, elastomer or wax. Many, however, are composites using a resilient base of paper, cloth or cork adhered to a metal foil or plastic facing, frequently one of the vinyl derivatives. The liner material used in a specific instance depends largely upon the products with which it will come into contact, and laboratory tests should be made before final decision.

Insertion of liners into plastic caps is a less simple task than inserting them into metal caps. In the latter, the diameter is smaller at the thread than at the dome of the cap. Therefore, a slightly oversized liner can be forced past the threads and will remain in position at the dome.

But with plastic closures, this procedure is possible only if an extension beyond the thread diameter is used to provide a retainer ring in the molded closure. This produces an undercut and necessitates stripping or stretching the hot closure over the extended portion of the plug.

More frequently the inside diameter of the threads is flush with the dome diameter to permit ready unscrewing of plug from cap. In this case liners must be slightly less in diameter than the threads and must be held in place against the dome by means of a suitable adhesive.

Designing closures

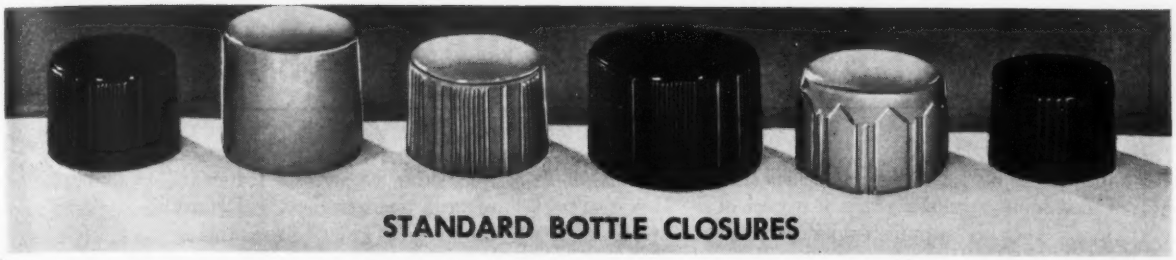
Because the package designer has such a broad field from which to choose in developing a molded cap, it is customary to consult an engineer familiar with the field. (See also *Design Suggestions for Molded Parts*, p. 454.)

Within the next few years it is expected that there will be an increase in the number of long-skirted caps and a marked rise in the variety of private designs, now that the war is over.

In developing a new private-design closure within a definite cost limit it should be remembered that a straight-sided cap will require only a new cavity or female portion of the mold, which can be used with a standard screw-plug or male plate. A closure which is ball-shaped, flared or of an unusual form will require both a new cavity plate and a special screw-plug plate.

The designing of molded caps is frequently carried out with an eye to improved functioning as well as beauty. For example, a decorative knurl or other ornamentation along the side of the cap may also make the closure easy to tighten and unscrew by permitting a firm grip.

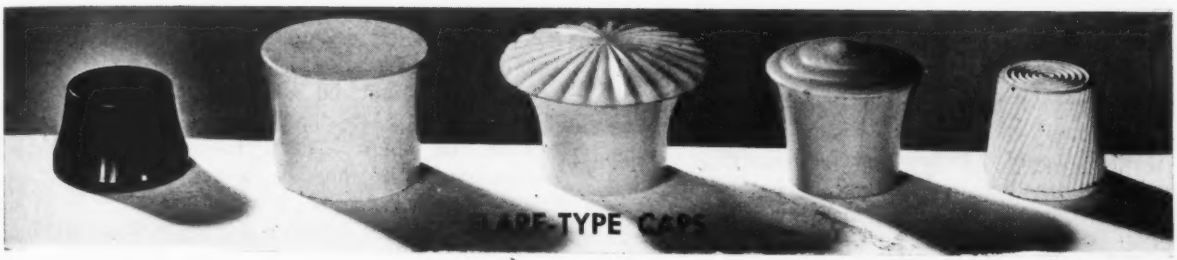
Rich designs may be engraved in either positive or reverse effect. Designs then may be hand-wiped with a different color for contrasting effect. Other methods of decoration are discussed in *Decoration of Plastics*, p. 457.



STANDARD BOTTLE CLOSURES



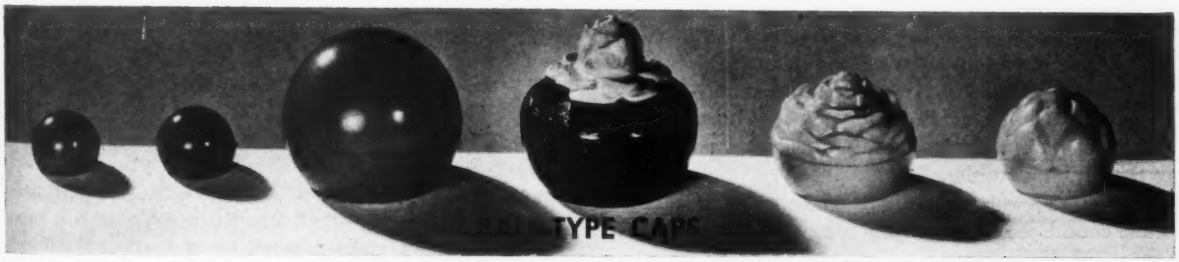
NOVELTY CAPS



SHAPE-TYPE CAPS



BULLET-SHAPE CAPS



BALL-TYPE CAPS



DOME-STYLE CLOSURES

Design suggestions for molded parts

Manufacturers of plastics parts learn the principles of designing through years of experience. However, many package suppliers do not mold their own plastics components. They merely design the container and subcontract plastics parts to custom molders. Since the design for a container is frequently drawn up before the molder is approached, it is well for the package designer to have a general understanding of the qualifications of the various materials and of the special advantages and limitations of the various molding methods which may be used.

Therefore, observance of the following pointers may aid the package designer in specifying plastics parts which can be molded of standard materials by standard molding practice and which permit the maximum simplicity in tooling.

Selection of material

The choice of the correct plastic material is as important to the designer in plastics as is the choice between cast iron and stamped aluminum to the designer in metals. Before drawing up the specifications it would be well to realize that materials are available which encompass a wide range of physical, thermal, chemical and mechanical properties.

Within the two basic classifications of thermosetting and thermoplastic materials, there are perhaps a dozen kinds of plastic suitable for packaging applications. Innumerable combinations and variations of special properties are obtainable by use of varying formulations. However, the blending of compounds to meet specific requirements is the responsibility of the molder, and specific formulation need not be specified by the designer. It is sufficient for him to select the material to be used on the basis of general properties, leaving the finer points to the manufacturer. Even in selection of the general type of material, it may be wise to consult with the plastics manufacturer who may have the latest information on relative costs and suitability of the various materials.

Proper selection of material to be used should include consideration of the following properties:

1. *Mechanical and physical properties*—Specific gravity; hardness; modulus of elasticity; refractive index; tensile, compressive, flexural and impact strengths; machining qualities
2. *Thermal properties*—Thermal conductivity, specific heat, thermal expansion, heat-distortion point, resistance to heat
3. *Chemical properties*—Effect of chemicals, effect of aging and sunlight, water absorption and the burning rate
4. *Decorative properties*—Range of availability as regards transparency and translucency and also the range of colors obtainable

The choice of material in a specific case may be restricted by some special requirement. Optical transparency, resistance to high temperatures and acid resistance are examples of properties not common to all plastics, and consequently the designer's choice may be automatically limited to those materials which do possess them.

The designer must also remember that a wide range of properties is given for each material. But in order to attain a high value of one property it will often be necessary to sacrifice some other desirable property which may be less essential in the particular application under consideration.

Selection of material and design for molding are closely related. A material which appears to be perfect for the job may, nevertheless, have to be discarded because it cannot be molded into the required design, because it does not flow well enough to fill out a thread or a barrier, because it has too great a variation in shrinkage to permit the necessary tolerances, or because it does not permit the molding-in of a delicate insert.

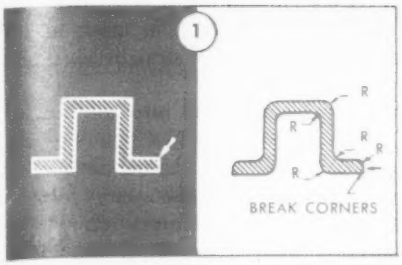
Frequently, several materials will be found satisfactory for a plastic packaging component. In this case, the relative cost of materials and suitable molding methods may determine the final choice. Because the prices fluctuate, no attempt has been made to list them in this volume. Materials suppliers should be consulted for this information.

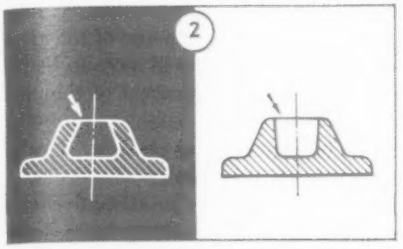
However, economy of production is not the only factor to be considered by the designer of a molded plastic packaging component. Since the original decision to use a plastic in a specific package is usually based upon its eye-appeal, it is important that its rich appearance not be sacrificed completely to considerations of cost.

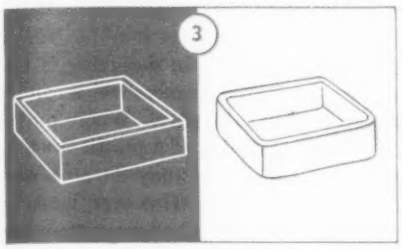
Frequently it is possible to design a package which uses several types of plastic materials or a combination of plastics with wood or metal. Not only is it possible to achieve many interesting and unusual effects by the use of such contrasting materials, but also to produce a package which utilizes each material in the particular part for which its special properties make it the most suitable.

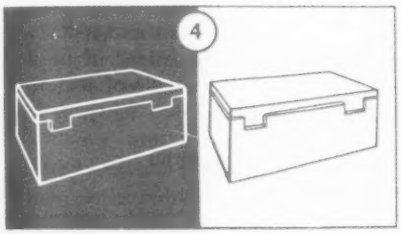
Specific information concerning the properties of the various materials will be found under *Plastic Materials Used in Packaging*, p. 433, and in the following charts: *Plastics for Packaging at a Glance*, opposite p. 440, *Properties of Molded and Cast Plastics*, opposite p. 462, and *Properties of Plastic Sheeting Used for Rigid Con-*

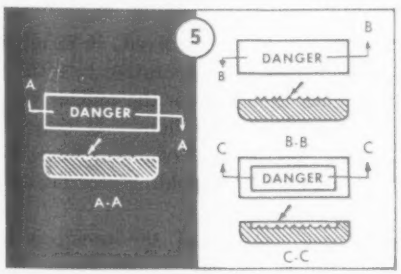
WRONG RIGHT

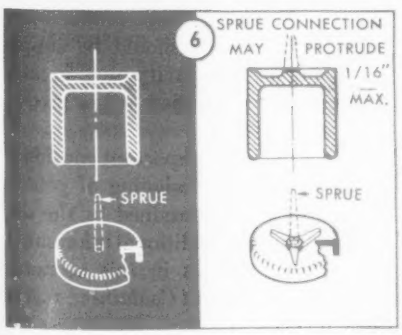












1—Corner radii and fillets should be specified at all points except parting lines. Generous radii (minimum of $^1/_{32}$ in.) permit easy mold machining and, in case of fillets, add strength to molded part. Breaking corners at flash line permits easy flash removal.

2—Avoid design details that will obstruct free ejection of part from mold. Where possible, give a liberal draft (1°–3°).

3—In designing molded parts, discard triangle and T-square, use compass and French curve.

4—Allow ample clearance in mating top and bottom of a box.

5—Sunken letters on a molded piece require cutting the mold down around them, which is expensive. Raised letters can be engraved in mold inexpensively. Intermediate in cost is sunken section shown in CC.

6—Large pieces molded in single-cavity injection molds are usually shot by connecting sprue directly to product. If sprue is at point not normally visible, there is no need to machine sprue flush with molded part; product drawing should specify maximum permissible height. If sprue is located on visible part, incorporate decorative motif at connection to facilitate finishing.

7—Parting lines located at sharp corners permit easy flash removal. If piece has corner radius, parting line must be on flat surface, necessitating buffing.

8—Constant wall thickness promotes uniform cure and shrinkage. Thin walls will shorten cure time.

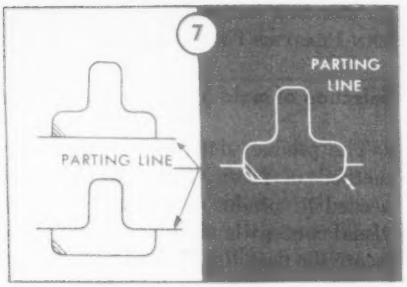
9—Camouflage parting lines. Ribs facilitate flash removal.

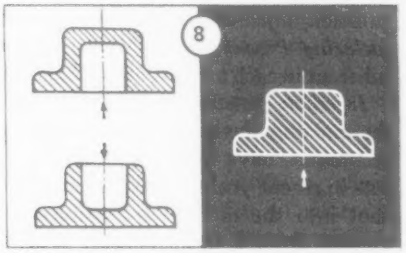
10—Corners of mating parts can be strengthened and corner interference avoided by fillet radii.

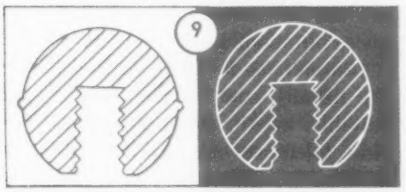
11—Avoid lettering on rounded surfaces. Lettering not perpendicular to direction of molding requires an extra moving piece in mold, increasing cost of mold.

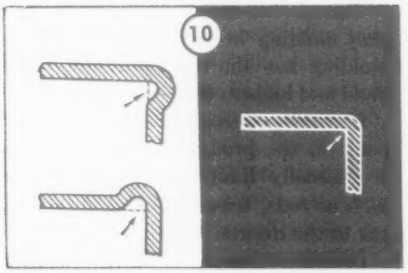
12—Unless broken with lines or stipple, large flat surfaces will show flow marks and "dog skin."

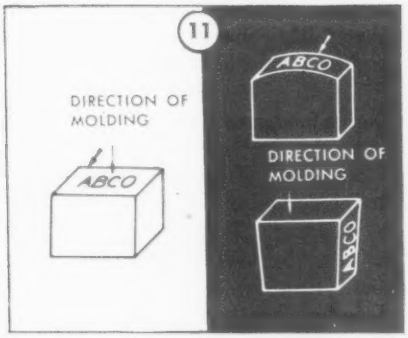
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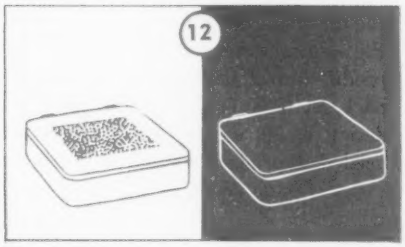












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tainers, p. 449. If further information is desired, the outstanding authority is the 1946 edition of the MODERN PLASTICS ENCYCLOPEDIA.[1]

Selection of molding method

The product designer must be able to visualize the method of fabrication and the mold which will be needed to produce the part he is specifying. This visual concept is necessary in order to position inserts, locate the flash line, prevent undercuts, etc. He should be able to decide whether it is to be molded by compression, injection, transfer or extrusion. (See *Manufacturing Processes*, p. 437.) Certain limitations are inherent in each method of molding.

Injection molding—In general, this method is used for molding thermoplastic materials, although special techniques have been developed for injecting thermosets in recent years. Weight of material which may be shot into the mold is limited, capacity of machines varying from 2 to 36 ounces. Particular advantages are the low cost of finished parts and the close tolerances obtainable.

Compression molding—Although thermosetting parts are usually compression molded, this process is not suitable where delicate inserts, intricate details or close tolerances are required. In these cases, transfer molding is preferable.

Transfer molding—Although preferable to compression molding in the cases mentioned above, transfer molding has the disadvantages of fewer cavities per mold and higher cost.

Extruding thermoplastics—Although rapid and inexpensive, the production of plastic parts by extrusion is generally limited to constant cross-section parts, such as rods, tubes and moldings, which later must be cut to the desired length.

Drawing—Drawn sections, cheaper than the same sections injection molded, are limited to parts which have fairly constant wall thickness and are characterized by relatively simple shapes.

Design fundamentals

Simplicity of the die is an end greatly to be desired in the designing of a plastic part for mass production by molding. True, complicated pieces can be manufactured by use of ingeniously constructed, intricate dies. However, much of the job of making a mold is done by experts skilled in the work, and naturally the process is an expensive one. The more complicated the die required to produce a molded piece, the greater the expense will be. Therefore, for the economical production of molded parts, it is important that the package designer understand those principles of plastic design which ensure maximum simplicity of the dies needed to produce the parts specified.

One fundamental rule will greatly aid the designer of plastic parts. Simply stated, it is: "Throw away your T-Square and triangle and use nothing but your compass and French curve." This, in brief, means that curves are simpler to mold than straight edges and sharp angles.

If lettering is to be incorporated into the molded piece, it is well to remember that raised letters on the plastic part will be less expensive than sunken ones, for the former may be engraved in the mold while the latter necessitate cutting the mold away around the letters. In connection with lettering, it should be noted that if a design calls for lettering not perpendicular to the direction of molding, the expense of the mold will be greater, since an extra piece will have to be included in the assembly to permit removal of the part after molding.

Wall section should be as uniform as possible. Heavy bosses on thin sections are not desirable.

From the standpoint of designing an attractive container, it is best to use lines or stipple to break large flat surfaces such as box lids, which otherwise tend to show flow marks and "dog skin."

As important as any one factor in designing is the determination of the maximum tolerances which can be allowed for each dimension of the part. Where pieces must be mated, as in the designing of a plastic lipstick holder or compact, close tolerances may be necessary to assure proper fit of lid and base. However, in other cases it is well for the designer to observe that the smaller the tolerances specified, the higher the price of the product, due to higher tooling costs and tool maintenance and greater number of rejections of finished pieces. The following are the chief causes of deviations in dimensions of plastic parts:

1. Variation in shrinkage of material
2. Mold misalignment
3. Flash-line thickness
4. Parting-line thickness

Because so many factors are involved, it is often desirable for the designer to place tentative tolerances on his part drawing and then discuss the matter with his molder before requesting quotations. It may be that a close tolerance specification on one dimension will make the part a very difficult molding problem and therefore increase the expense.

Before beginning construction of the mold, it is highly desirable to make an accurate model of any part which is complicated in design. If large production is contemplated, making of a model should be supplemented by construction of a single-cavity mold in order that molding technique may be studied before production is started.

These are just a few of the more important considerations which apply to the proper designing of plastics parts. Further suggestions are contained in the diagrams on the preceding page, and additional information will be found under other articles in this section—*Molded Containers*, p. 441, *Fabricated Containers*, p. 445, and *Molded Closures*, p. 451.

[1] Published by Plastics Catalogue Corp., 122 E. 42nd St., New York 17, N. Y. $6.00.

Decoration of plastics

The decorative appearance so important for the merchandising appeal of any plastic container may be simply a matter of over-all color or an unusual surface, or it may involve the reproduction of an abstract design, trim, trade-mark or product identification. Some decorative effects may be obtained in the course of processing the plastic material and shaping it into container form, but others require extra steps.

Decoration in color

One of the chief advantages of plastics over older materials in the highly competitive field of packaging has been the permanency of their over-all color. When pigments are incorporated into the material during processing, they are an integral part of the finished piece and neither water nor abrasion will remove them.

There are cases, however, when it is necessary to paint, enamel or lacquer the whole or a part of the container surface.

Plating—Plating of metal on plastics simulates the appearance of metal without sacrificing the light weight of plastics. Electroplating on thermosetting plastics is a more expensive process than on metal and frequently requires an intermediate layer which will adhere to both the metal and the plastic. Other means of applying metal coatings include: spraying, which results in thick granular coats; expensive and lengthy vacuum deposition; and chemical reduction methods, which involve deposition of metals from unstable gaseous compounds or the reduction of metallic compounds in solution. Silver films produced by chemical reduction are the most widely used metal coatings on plastics, and their chief uses are to achieve a mirror surface and as a conductive coat on an article to be electroplated.

By use of various masking methods it is possible to achieve rather elaborate metallic designs against a contrasting background of plastic. Such decorating has been used on compacts and cigarette cases, but is too expensive for packaging applications except where the container is designed for re-use.

Silk screen printing—This is a very important method of applying accurately registered multicolor designs to molded plastic containers. (Although silk screening is applicable to either flat or curved surfaces, when continuous bands are printed on cylindrical containers there may be a slight smear at the joining point.) In this method a thin stencil of gelatin or cellulose nitrate lacquer is supported on a strong mesh of silk, stainless steel or bronze. The printing agent is forced through the mesh by a rubber squeegee. Although the method is quicker than hand painting, a different stencil and a separate operation are of course required for each color. However, the resulting appearance often justifies the extra expense, in such fields as cosmetic packaging. For silk screening on thermosetting materials, alkyd resin inks form an enamel-like raised imprint. A similar raised surface may be obtained on thermoplastics, but it is preferable to use an ink which, through solvents, unites permanently with the plastic.

Other printing methods—Various other printing processes have been adapted to apply color-contrasting trade-marks, identifications, manufacturers' names, designs, etc., to rigid plastic sheets. These methods in-



1—Bottles for Sportsman talc, injection molded of styrene by Prolon Plastics, are decorated in from eight to eleven colors by the silk screen process of the Creative Printmakers Group. Each color applied requires a separate silk screen operation.



PHOTO, COURTESY INTERNATIONAL PRINTING INK DIV., INTERCHEMICAL CORP.

2—Large machines for milling inks commercially operate in similar way to laboratory mill shown here.

clude letterpress, most widely used method, in which matter is printed from raised type; intaglio; rotogravure, which saves time by use of instant-drying inks and thus permits rapid printing of several colors; and offset printing, by which two colors may be inexpensively applied to flat or rounded surfaces from a rubber pad upon which ink has been deposited.

Decalcomania—Transfers may be effectively applied to the surface of all plastics materials, and they permit the inclusion of multicolor pictures.

Problems—Chief problem in the adaptation of coating and printing methods to plastic surfaces is that of the printing material. The slow-drying inks usually required for letterpress printing, for example, slow down production, although special fast-drying inks have been developed for use on ethyl cellulose sheeting. Furthermore, conventional inks tend merely to harden on the smooth, nonabsorbent plastic surface, with poor adhesion. One solution has been to coat over the printed sheets with a transparent, water-white liquid plastic which hardens to protect both plastic base and ink.

A different type of problem is presented by the fact that the plasticizer in some thermoplastics has a greater affinity for the lacquer coating than for the plastic. Therefore, the present trend is toward the use of special coatings which contain a solvent for the thermoplastic material and are thus permanently bonded to it.

Molded, carved and engraved decoration

At the opposite extreme from decoration by surface application of color is decoration by means of contrasting surface without contrast of color. Markings of this type are of course permanent and may be accomplished in various ways. Embossed lettering, trade-marks and abstract designs are sometimes molded into the container. In another case, with equipment of the conventional woodworking type, designs may be carved into acrylic sheets which are to be fabricated into boxes. Sandblasting, or air blasting of fine grit material through a stencil of molded rubber or plastic, produces a marking which contrasts with the polished surface.

Pantographic engraving—This is a widely practiced method of engraving on plastics. Many machines used in this process have adjustable pantographic ratios; that is, they can produce many sizes of engraving from the master type. An automatic depth-of-cut regulator permits engraving on concave, convex, spherical or beveled surfaces.

Combination methods

However, in many cases it is felt that the desired design may be most effectively obtained by a method which combines the eye-catching appeal of color with the permanency of molded-in or engraved markings. For a long time this procedure always necessitated two steps. The design was either incorporated in the mold, or engraved after molding. Color was filled in later.

A typical method of this type, still widely used for molded containers, particularly in the cosmetic field, is that of *wiped-in color*. Coloring matter is applied over the marked surface and then wiped off by hand, leaving a deposit of pigment in the indented portions.

Acid etching of cellulose acetate sheets is done by a process similar to that used for metals. Lettering or design is covered with a resistant; exposed sections are etched with a solvent, then colored.

Metal inlaying affords a rich and attractive contrasting trim on re-use containers for luxury items. The inlay may be molded into the container, but more frequently a recess is engraved in the plastic surface and the inlay is cemented in place or locked in by pressure.

In all of the above methods, marking of the design and coloring are accomplished in two separate operations. However, the current trend is toward simultaneous indenting and coloring.

Roll-leaf hot marking, used chiefly on thermoplastics, accomplishes this with less expense than is required for molded-in designs. With each operation of the press, electrically heated type or dies are forced into the surface of the plastic. At the same time an intervening metallic or pigmented stamping foil, fed from a roll, is fused into the impression. Although most presses are of the vertical type, a newer rotary press is available which is particularly suitable for marking the curved surfaces so often found in molded packaging applications. A similar method is used for the thermosetting materials. Both methods are particularly suitable for applying trade-marks or identifications which are intended to endure as long as the container.

(More data on many of these processes may be found in *Methods of Reproducing Package Designs*, p. 68.)

Stock molds

The packager who decides in favor of a plastics container for his product would do well to consider using a stock mold item for his package. Unless familiar with the field of packaging in plastics, he may not realize the number and variety of stock mold items available. The majority of all plastic closures for bottles and jars, as well as a great many plastic cosmetic containers, are made with stock molds. Even a packager who needs a specialty item may find that a suitable mold exists by consulting the catalog of *Plastic Stock Molds*.[1]

The numerous varieties may be given further individuality by specifying particular colors and by printing designs, brand names or trade-marks on the surface after molding. (See *Decoration of Plastics*, p. 457). If the run is long enough, the molder will usually adapt the stock mold to incorporate a brand name or design. Special steel inserts, engraved with the desired wording or design, can be inserted in a stock mold at a slight extra cost.

Purchasers may also specify material to be used, but selection is limited by molding method for which the stock mold was constructed.

Outstanding advantage of using a stock mold is the saving in cost. When the packager wants a container or closure for a utility product, or wants only a short run of containers, the expense of constructing a special mold may not be justified. In such a case, the use of a stock mold is indicated. Each packager pays only a small fraction of the high cost of making the mold, for the molder amortizes that expense over a number of orders.

Secondly, there is the saving in time. Since the mold is already in existence, the customer need wait only for the press capacity and the availability of materials. Occasionally, even this delay may be eliminated, for some custom molders keep in stock large quantities of popular items, ready to fill orders.

[1] Compiled by Stock Mold Dept., MODERN PLASTICS magazine, 122 E. 42nd St., New York 17, N. Y. Price $5.

Other stock items

Stock mold items discussed above are produced by either the compression or the injection molding method. However, the term is loosely used to include a number of other articles. Transparent fabricated acrylic boxes and display components are frequently stock pieces. Also used in displays are laminated sheets and rods, while rigid laminated tubes may be fabricated into tubular containers.

Other stock tubing, in cylindrical or angular shapes, is extruded of transparent or opaque cellulose materials in various lengths, diameters and wall thicknesses. The ends may be threaded for screw caps, if desired, or by a special process one end may be sealed off to form a vial, bottle or jar. A thin-walled extrusion may be used as the basis for a collapsible tube.

1—Many closures now used by packagers are stock mold items. The wide variety of available standard and special-purpose types meet most closure needs.



2—Stock molds are widely used to produce cosmetic containers, particularly where individuality of the design is less important than low packaging costs.



Strip coating

by Dr. Charles E. Waring

Strip coating refers to a comparatively new method of packaging, in which small metal articles are dipped manually or mechanically into a tank containing molten plastic. This compound cools and hardens to form a close-fitting protective skin around the metal object. Developed during the war for the anti-corrosion protection of small ordnance parts en route to forward areas, this coating package was found to be abrasion resistant as well as waterproof. Replacing older corrosion protection by grease or oil, paper and wax, strip coating saved countless hours in packing. Easily cut and stripped, this coating cut to a minimum the time required for unpacking. The technique shows promise of becoming a standard packaging method.

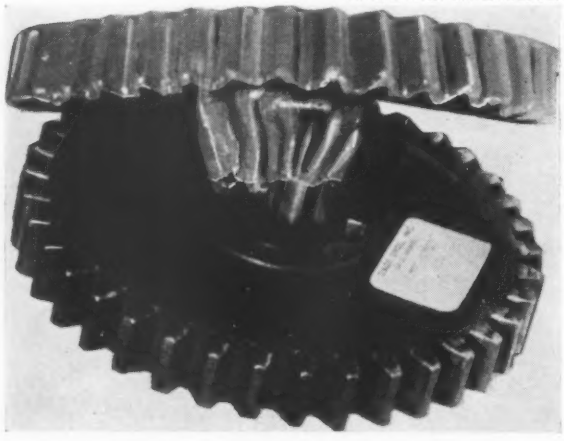
During the last year, plastic strip-coat packaging has made further advances. A new type of coating, based on cellulose acetate butyrate, has made its appearance on the market. The new material has special characteristics all its own, which make it complementary, rather than competitive, to the previously accepted ethyl cellulose stripping compound. In addition, some promising experimentation has been conducted with polyamide (nylon) resin as a strip-coating ingredient.

Ethyl cellulose coating

The ethyl cellulose compound contains about 25 per cent of ethyl cellulose as a base, the balance of the ingredients consisting chiefly of oils, waxes and resins. It is transparent, but becomes an opaque white upon long exposure to high relative humidity. This compound is applied at dipping temperatures of 375 to 400 deg. F., and on cooling passes through a gelation stage which causes it to set rapidly with a minimum of "string" time. It deteriorates rapidly if overheated in the melting tank, but can be used very satisfactorily with proper melting equipment designed with accurate thermostatic control and an even heat distribution.

1—Coating has been slit and stripped from the gear. Note close reproduction of contours of coated part.

PHOTO, COURTESY ERONEL INDUSTRIES



Cellulose acetate butyrate coating

The cellulose acetate butyrate material contains about 50 per cent of the base plastic in the formula. It is transparent and, unlike the ethyl cellulose material, it maintains its transparency even under high humidity exposure. It is applied at temperatures from 300 to 350 deg. F., preferably at the higher extreme of the range. Because of its somewhat lower application temperature, it deteriorates less than ethyl cellulose, due to aging in the melting tank. It does not pass through a gelation state and hence has a longer "string" time. It cannot always be applied to parts with thin sections and low heat capacity (such as piston rings) because it slides off before setting can occur. It has approximately twice the load-carrying capacity of the ethyl cellulose compound, and can be applied to heavier parts without danger of "squeeze-out" or "cut-through." The cellulose acetate butyrate coating has lower tensile strength, higher elongation and greater strippability; hence it can be applied to, and stripped from, parts of greater intricacy—i.e., those with smaller holes, greater undercuts, etc.

However, with all its advantages, cellulose acetate butyrate strip coating is limited in use because it costs approximately twice as much as the ethyl cellulose. Both the higher cost and the more versatile properties are due to the higher percentage of plastic.

Dipping methods

Application of these materials is either by string suspension or by double dipping. String suspension permits the dipping in a single operation, but introduces other complicating factors. String must be used which will not wick moisture into the interior of the coating; this usually requires preimpregnation of the string with a corrosion-preventative compound. Unimpregnated strings also frequently contain enough moisture to produce pronounced bubbling at the temperature of the dipping bath. This difficulty can be eliminated by predrying the string over silica gel. Some processors also make it a practice to clip the string and then seal over the string-opening with a soldering iron.

Double dipping is accomplished by dipping first one end of the part, then the other end, with about one-in. overlap. The ethyl cellulose compositions do not form a true bond or weld at this overlap, but are sufficiently adhesive to prevent the ingress of water or moisture. The butyrate formulations do form a true weld.

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Suitable parts

In selecting parts for protection with these compounds, it is necessary to give primary consideration to two factors: Can the compound be stripped from the part, and will it carry the weight of the part without cutting through? With respect to the first problem, where there is any reasonable doubt, the only safe way is to dip the part in question in the compound to be used, allow the coating to harden for 24 hr. or more, and then try to remove it. With respect to the second problem, adequate cushioning should always be used.

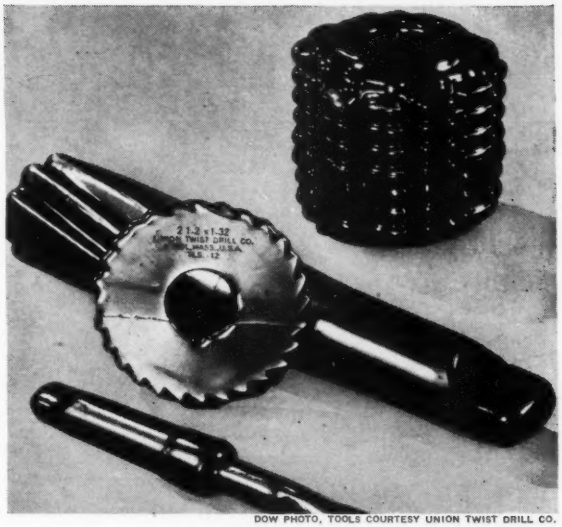
A new technique has recently been devised which eliminates many of the difficulties encountered in coating irregularly shaped parts with either type of compound. This new technique involves wrapping aluminum foil around the part before dipping.

Field for future use

Commercial export in the years ahead should be accomplished to the far greater satisfaction of consignees, due to utilization of the packaging knowledge gained in shipping war matériel under unfavorable conditions. Small metal machinery parts, for instance, should arrive in perfect condition when strip coated.

The future success of strip coating, however, will probably be as much a result of its utility in protection of articles in storage as due to its function of protecting during shipment. Such protection should eliminate the normally high loss through corrosion, in aircraft and automotive replacement part centers, where large inventories are stored for considerable lengths of time. Auto repair shops and hardware merchants should also benefit greatly by such packaging. The close reproduction by the plastic skin of the surface contours of the enclosed part aids in identification and permits storage of miscellaneous small parts and tools in bins, perfectly protected until time for use by garage mechanic or hardware customer. When the more exact identification of a size, code number or trade name is necessary, use of the transparent butyrate coating is indicated, although if ethyl cellulose is used, the marking may be stamped in the coating or attached by a tag.

These compounds appear to have pre-empted one postwar field, in particular—the protection of cutting tools. Strip coating has proved unsurpassed in protecting blades from corrosion and physical damage.



DOW PHOTO, TOOLS COURTESY UNION TWIST DRILL CO.

2—Part sizes can be seen through coating. Overlap visible in gear coating is result of double-dipping.

PHOTO, COURTESY DOW CHEMICAL CO.



3—Strip coating will be used for the protection of cutting edges and other hardware items against damage from corrosion during export or in storage.

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Trends to watch

The future of plastics in the packaging field during the years ahead will depend upon both its utilitarian functions and its decorative possibilities.

Utility

Experience gained during the war years indicated that the combined strength and light weight of various forms of plastic makes them ideal for use in shipping containers. Thus, it is expected that waterproof, resin-bonded plywood drums and boxes will be used increasingly in the export and air transportation fields.

Inexpensive lightweight containers are also made of sisal batting, impregnated with phenolic resin and formed into large shell shapes by bag molding. Other large, strong boxes can be compression molded from phenolic-impregnated pulp preforms.

The chemical industry is adopting plastics for a wide variety of special applications. The chemical resistance of many plastics, notably polystyrene, adapts them also for drug and cosmetic jars and closures.

Special properties of plastic materials will undoubtedly permit their use in still other special packaging applications. However, as all types of packaging material become more available, plastics may be replaced by other materials in a few of the applications in which it performed wartime substitute service.

Decorative appeal

The trend in use of plastics containers for decorative appeal will be, in general, merely an accentuation of the prewar emphasis upon this advantage of packaging in plastics. Although materials shortages, which forced standardization and substitution measures during the past few years, have not yet been completely relieved, designers now have much less restriction than formerly on types and quantities of plastics which they specify.

Transparency will be the key trend in decorative packaging during the immediate future. Transparent acrylic, polystyrene, ethyl cellulose and cellulose acetate, no longer needed for war are in demand by the packaging industry. They are finding wide use in glamorized packages for perfumes and other cosmetics, where sales-producing visual appeal warrants the extra cost. Fabricated semi-rigid cellulose acetate sheeting is being used to box an increasing variety of products—from blankets to toiletries. Transparent plastic display components will be used to an increased extent.

New materials

Several plastics materials have reached commercial production comparatively recently, so that their packaging possibilities have not yet been fully exploited.

Polyamide (nylon) molding compounds are available in translucent ivory and a wide range of transparent shades. The material's resiliency and resistance to breakage indicate its suitability for molded containers.

Polyethylene saw one of its first packaging applications as a film, but also lends itself to blow molding and swaging to form containers which will be stable in boiling water. Its chemical inertness suggests its use for closures of chemical bottles and carboys, where because of its flexibility and resiliency, it can form tight, leakproof screw seals. It is an expensive plastic.

Cellulose propionate is a newcomer to the field. Its lustrous molded finish, dimensional stability, resistance to moisture absorption and absence of odor make it ideal for many standard containers.

(For additional information on these new plastics, see *Plastic Materials Used in Packaging*, p. 463.)

Improved methods

In general, restrictions on manufacture of machinery and equipment during the three and a half years ending in the middle of 1945 provided a sharp check on the development of new techniques for forming and finishing plastics. However, some of the plastics shaping methods, developed specifically for war needs, may prove valuable in peacetime applications, including many in the packaging industry.

Thus, laminates, hitherto unimportant in packaging, may become more important for strong, lightweight shipping boxes, display units, etc., due to progress in the techniques of post-forming a flat laminated blank and impression molding or low-pressure laminating impregnated fibrous material.

In the techniques of blowing thermoplastic bottles, too, much progress has been made in the last few years, and it may be expected that further developments in this process will occur.

Most important plastics-manufacturing technique developed during the past year, from the standpoint of the packaging industry, is the production of cellulose acetate sheeting by the dry extrusion process, in contrast to the older methods of making sheets by wheel casting or block pressing and skiving. Estimates are that the new process will result in a 40 per cent reduction in the cost of transparent fabricated containers made from these sheets, permitting their use for packaging even dime-store items. A further advantage of the new sheeting is that it is well suited for use with the new automatic methods of making set-up boxes and of producing drawn containers rapidly and economically.

(For further data on new forming and fabricating methods, see *Manufacturing Processes*, p. 437, and *Fabricated Containers*, p. 445.)



Values for properties in this chart are based on figures submitted by a number of manufacturers. Differences in test procedures and sizes of specimens may lead to erroneous conclusions if direct comparisons are attempted. Special grades of materials often excel in one particular property.

PROPERTIES	PHENOL-FORMALDEHYDE COMPOUNDS			PHENOL-FURFURAL COMPOUNDS
	Molding		Cast	
	No Filler	Woodflour and Cotton Flock Filler	No Filler	Woodflour Filler
Molding Qualities	Fair	Excellent	—	Excellent
Compression Molding Temp., ° F.	270–320	300–400	—	280–400
Compression Molding Pressure, lb. per sq. inch	2000–5000	2000–4500	—	1000–5000
Injection Molding Temp., ° F.	—	275–375	—	250–400
Injection Molding Pressure, lb. per sq. inch	—	2000–20000	—	300–10000
Compression Ratio	2.0–2.6	2.2–4.4	—	2.2–3.0
Mold Shrinkage, inch per inch	0.009–0.011	0.005–0.009	—	0.005–0.010
Specific Gravity	1.25–1.30	1.32–1.47	1.26–1.335	1.32–1.42
Specific Volume, cubic inch per lb.	22.2–21.3	20.9–18.9	22.0–20.8	20.0–19.6
Refractive Index, nD	1.5–1.7	—	1.58–1.66	—
Tensile Strength, lb. per sq. inch	7000–10000	6500–9500	2000–9000	5000–8500
Elongation, %	1.0–1.5	0.4–0.8	—	—
Modulus of Elasticity in Tension, lb. per sq. inch $\times 10^5$	7–10	10.5–12.5	4	10–25
Compressive Strength, lb. per sq. inch	10000–30000	24000–32000	4000–25000	16000–36000
Flexural Strength, lb. per sq. inch	12000–17000	9000–12000	2000–14000	8000–15000
Impact Strength, ft. lb. per in. of notch ½ × ½ in. notched bar, Izod test	0.20–0.30	0.24–0.50	0.25–0.60	0.2–0.4
Hardness, Brinell No. (2.5 mm. ball, 25 kg. load)	—	30–45	5.8–30	35–40 (50 kg.)
Hardness, Rockwell	M120–M130	M110–M120	M20–M110	B65–B75
Thermal Conductivity, 10^{-4} cal. per sec. per sq. cm./1° C. per cm.	3–6	4–7	3–5	3.5–12
Specific Heat, cal. per ° C. per gram	0.3–0.4	0.35–0.40	0.3–0.4	0.3–0.4
Thermal Expansion, 10^{-5} per ° C.	2.5–6.0	3.0–4.4	5–15	3–7
Resistance to Heat, ° F. (continuous)	250	250	160	300
Distortion under Heat, ° F.	240–260	260–300	95–167	240–300
Water Absorption, 24 hr., ⅛-in. thickness, %	0.1–0.2	0.4–1.0	0.02–2.0	0.2–0.6
Burning Rate	Very low	Very low	Very low	Very low
Effect of Sunlight	Surface darkens slightly	General darkening	Colors may fade	Light shades discolor
Effect of Weak Acids	None to slight depending on acid			None to slight depending on acid
Effect of Strong Acids	Decomposed by oxidizing acids; reducing and organic acids none to slight effect			Decomposed by oxidizing acids; reducing and organic acids no effect
Effect of Weak Alkalis	Slight	Slight to marked depending on alkalinity		Slight to marked depending on alkalinity
Effect of Strong Alkalis	Decomposes	Decomposes	Decomposes	Decomposes
Effect of Organic Solvents	None	None on bleedproof materials	Attacked by some	None to slight
Effect on Metal Inserts	Inert	Inert	Inert	Inert
Machining Qualities	Fair	Fair to good	Excellent	Fair to good
Clarity	Transparent; translucent	Opaque	Transparent; translucent; opaque	Opaque
Color Possibilities	Dark colors	Limited	Unlimited	Limited

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PROPERTIES OF MOLDED AND CAST PLASTICS

URAL DS	UREA-FORMALDEHYDE COMPOUND	MELAMINE-FORMALDEHYDE COMPOUND	VINYL CHLORIDE-ACETATE RESINS		VINYLIDENE CHLORIDE RESINS (Molding)	METHYL METHACRYLATE RESIN		S
r	Alpha Cellulose Filler	Alpha Cellulose Filler	Rigid	Flexible Unfilled		Cast	Molding	
	Excellent	Excellent	Excellent	Good	Excellent	Good	Excellent	
	290–325	280–340	280–325	250–340	220–350	—	280–370	
)	1500–6000	1500–6000	1500–2000	500–1000	500–5000	—	1000–3000	
	—	—	280–300	250–340	300–400	—	325–500	
)	—	—	18000–30000	18000–30000	10000–30000	—	10000–30000	1
	2.2–3.0	2.0–2.7	2	—	2	—	1.6–2.2	
0	0.005–0.011	0.006–0.009	0.001 Max.	0.02–0.10 (Varies with plasticizer)	0.005–0.015	—	Compression 0.001–0.005 Injection 0.003–0.006	C
	1.45–1.55	1.45–1.55	1.34–1.37	1.2–1.6	1.65–1.72	1.18–1.20	1.16–1.20	1
	19.1–17.9	19.1–17.8	20.7–20.2	23.0–17.3	16.8–16.1	23.4–23.0	23.8–23.0	2
	1.54–1.56	—	1.52–1.53	—	1.60–1.63	1.49–1.50	1.49–1.51	
)	6000–13000	7000–8000	4500–8000	1000–9000	3000–6000	6000–10000	6000–10000	3
	—	—	—	Up to 500	20–300	1–15	1–15	
	12–15	—	3.5–4.1	—	0.4–0.8	3–5	3–5	
00	25000–30000	27000–37000	—	—	7500–8500	11000–13000	12000–15000	1
0	10000–13000	10000–16000	7500–14000		4000–6000	10000–15000	13000–19000	4
	0.24–0.36	0.24–0.35	0.25–0.5	(Varies with plasticizer)	0.3–1.0	0.2–0.6	0.2–0.4	
	48–54 (500 kg., 10 mm.)	—	12–15	—	—	18–20	18–20	
	M118–M122	M118–M122	—	—	M50–M65	M60–M100	M60–M112	M
	7.1	—	4.0	3.9–4.0	3	4–6	4–6	
	0.4	—	0.24	0.30–0.50	0.32	0.35	0.35	
	2.5–4.5	2.0–4.5	6.9	7–25	19	8	8–9	
	180	210	130	150	160–200	140–160	120–160	
	260–280	385	125–135	—	150–180	155–200	145–190	
	0.75–2.0	0.3–0.6	0.05–0.15	—	<0.1	0.4	0.3–0.5	
	Very low	Nil	Nil	(Varies with plasticizer)	None	Slow	Slow	
liscolor	None	Slight color change	Darkens on prolonged intense exposure	Slight fading	Slight	Very slight	Very slight	
ght n acid	←	None	None	None	None	Practically nil	Practically nil	
oxidiz- cing and o effect	Decomposed or surface attacked	Decomposes	None	None to slight	Highly resistant	Affected only by oxidizing acids		At oxi
rked kalinity	←	None	None	None	Resistant	Practically nil	Practically nil	
es	Decomposes	Attacked	None	None to slight	Resistant	Practically nil	Practically nil	
ght	←	None	Resists alcohols, aliphatic hydrocarbons and oils. Soluble in ketones and esters; swells in aromatic hydrocarbons		Resistant	Soluble in ketones, esters and aromatic hydrocarbons		ar e hy
	Inert	Inert	Inert	Inert	Inert	Inert	Inert	
od	Fair	Fair	Good	—	Good	Fair to excellent	Excellent	Fa
	Translucent; opaque	Translucent	Transparent to opaque	Transparent to opaque	Translucent to opaque	Transparent (90–92% light transmission)		Tr (88 tra
l	Unlimited; pastel shades	Unlimited	Unlimited	Unlimited	Extensive	Unlimited	Unlimited	U

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MELAMINE-FORMALDEHYDE COMPOUND	VINYL CHLORIDE-ACETATE RESINS		VINYLIDENE CHLORIDE RESINS (Molding)	METHYL METHACRYLATE RESIN		POL STYR
Alpha Cellulose Filler	Rigid	Flexible Unfilled		Cast	Molding	
Excellent	Excellent	Good	Excellent	Good	Excellent	Excel
280–340	280–325	250–340	220–350	—	280–370	275–
1500–6000	1500–2000	500–1000	500–5000	—	1000–3000	1000–
—	280–300	250–340	300–400	—	325–500	375–
—	18000–30000	18000–30000	10000–30000	—	10000–30000	10000–
2.0–2.7	2	—	2	—	1.6–2.2	2.0–
0.006–0.009	0.001 Max.	0.02–0.10 (Varies with plasticizer)	0.005–0.015	—	Compression 0.001–0.005 Injection 0.003–0.006	Compr 0.002– Injec 0.002–
1.45–1.55	1.34–1.37	1.2–1.6	1.65–1.72	1.18–1.20	1.16–1.20	1.05
19.1–17.8	20.7–20.2	23.0–17.3	16.8–16.1	23.4–23.0	23.8–23.0	26.3–
—	1.52–1.53	—	1.60–1.63	1.49–1.50	1.49–1.51	1.5
7000–8000	4500–8000	1000–9000	3000–6000	6000–10000	6000–10000	3000–
—	—	Up to 500	20–300	1–15	1–15	1.5–
—	3.5–4.1	—	0.4–0.8	3–5	3–5	1.7–
27000–37000	—	—	7500–8500	11000–13000	12000–15000	11500–
10000–16000	7500–14000	(Varies with plasticizer)	4000–6000	10000–15000	13000–19000	4800–
0.24–0.35	0.25–0.5		0.3–1.0	0.2–0.6	0.2–0.4	0.26–
—	12–15	—	—	18–20	18–20	20–
M118–M122	—	—	M50–M65	M60–M100	M60–M112	M55–
—	4.0	3.9–4.0	3	4–6	4–6	2.5–
—	0.24	0.30–0.50	0.32	0.35	0.35	0.3
2.0–4.5	6.9	7–25	19	8	8–9	6–
210	130	150	160–200	140–160	120–160	150–
385	125–135	—	150–180	155–200	145–190	165–
0.3–0.6	0.05–0.15	—	<0.1	0.4	0.3–0.5	0.0
Nil	Nil	(Varies with plasticizer)	None	Slow	Slow	Sl
Slight color change	Darkens on prolonged intense exposure	Slight fading	Slight	Very slight	Very slight	Yell slig
None	None	None	None	Practically nil	Practically nil	No
Decomposes	None	None to slight	Highly resistant	Affected only by oxidizing acids		Attac oxidizi
None	None	None	Resistant	Practically nil	Practically nil	No
Attacked	None	None to slight	Resistant	Practically nil	Practically nil	No
None	Resists alcohols, aliphatic hydrocarbons and oils. Soluble in ketones and esters; swells in aromatic hydrocarbons		Resistant	Soluble in ketones, esters and aromatic hydrocarbons		Solu aroma chlor hydro
Inert	Inert	Inert	Inert	Inert	Inert	In
Fair	Good	—	Good	Fair to excellent	Excellent	Fair t
Translucent	Transparent to opaque	Transparent to opaque	Translucent to opaque	Transparent (90–92% light transmission)		Trans (88–92 transm
Unlimited	Unlimited	Unlimited	Extensive	Unlimited	Unlimited	Unli

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The manufacturers should always be consulted before making a choice of material. In order to facilitate communications with the producers of these materials, the names and addresses of manufacturers of each of these chemical types of plastics are listed in the Directory Section.

	POLY-STYRENE	CELLULOSE COMPOUNDS				
		Ethyl Cellulose	Cellulose Acetate	Cellulose Acetate, High Acetyl	Cellulose Acetate Butyrate	Cellulose Nitrate (Pyroxylin)
	Excellent	Excellent	Excellent	Excellent	Excellent	Good
	275–350	250–400	260–420	260–390	260–370	185–250
	1000–5000	500–5000	500–5000	500–5000	500–5000	2000–5000
	375–500	350–500	340–500	340–500	340–420	—
	10000–30000	3000–30000	3000–30000	3000–30000	3000–30000	—
	2.0–2.3	2.0–2.5	2–2.8	2.0–2.8	2.0–2.8	—
	Compression 0.002–0.005 Injection 0.002–0.008	0.001–0.010	Positive and injection 0.002–0.007; Semi-positive 0.005–0.007; Flash 0.008–0.009			—
	1.051–1.070	1.07–1.18	1.27–1.37	1.27	1.10–1.24	1.35–1.40
	26.3–25.9	25.9–23.4	21.8–20.2	21.8	25.2–22.4	20.5–19.8
	1.59	1.47	1.46–1.50	1.47	1.47–1.49	1.50
	3000–8500	2000–10000	2000–8200	3000–8000	1400–6700	3000–10000
	1.5–3.5	5–100	7–80	4–45	35–95	25–50
	1.7–4.7	0.6–5.0	0.6–3.5	1.0–3.5	0.5–2.0	2–4
	11500–17000	3000–20000	5000–33000	5000–36000	7500–22000	20000–30000
	4800–19000	3000–12000	2000–12000	2000–13000	1600–12000	6000–15000
	0.26–0.6	0.6–11.5	0.4–6.2	0.7–6.0	0.6–9	2.0–8.0
	20–30	4–9 (10 kg.)	4.5–12 (10 kg.)	6–12 (10 kg.)	6–12	8–11 (10 kg.)
	M55–M95	R50–R110	R40–R120	R80–R120	R40–R120	R90–R120
	2.5–3.3	4–7	4–8	5	4–8	3.1–5.1
	0.32	0.3–0.5	0.3–0.45	0.37–0.42	0.3–0.4	0.34–0.38
	6–8	10–20	8–16	10–15	11–17	9–16
	150–170	140–220	140–220	150–220	140–220	ca. 140
	165–190	100–180	112–215	120–215	100–209	120–165
	0.01–0.06	1.0–2.5	2.0–6.0	1.5–2.9	1.0–2.4	0.7–4.0
	Slow	Slow	Slow	Slow	Slow	Very high
	Yellows slightly	Slight	Slight	Slight	Slight	Discolors and becomes brittle
	None	Slight	Slight	Slight	Slight	Slight
	Attacked by oxidizing acids	Decomposes	Decomposes	Decomposes	Decomposes	Decomposes
	None	None	Slight	Slight	Slight	Slight
	None	Slight	Decomposes	Decomposes	Decomposes	Decomposes
	Soluble in aromatic and chlorinated hydrocarbons	Widely soluble	Soluble in ketones and esters; softened or slightly soluble in alcohol; little affected by hydrocarbons			
	Inert	Inert	Inert	Inert	Inert	—
	Fair to good	Good	Good	Good	Good	Good
	Transparent (88–92% light transmission)	Transparent; translucent; opaque	Transparent; translucent; opaque	Transparent; translucent; opaque	Transparent; translucent; opaque	Transparent; translucent; opaque
	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited	Unlimited

y form.

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ADVERTISING FOR PLASTICS

Plastics and it's part in your sales picture
8 PAGES OF CLEAR, CONCISE INFORMATION







MACK MOLDING FACILITIES
include those from the collaboration and design stage to final production and delivery. Three plants—Wayne, N. J.; Arlington, Vermont; and Waterloo, P.Q., Canada —are ready to serve you.

... write for your copy today!

Everything in plastics for the packaging industry. Jar closures—in a wide range of colors, styles and standard sizes; cosmetic items—including razor blade boxes, compacts, containers,etc.; seals and caps—of every size and type; for foods, drugs and beverages; housings, cases and assemblies for every requirement and purpose. Practical information on all types of plastic moldings.

This brochure is *not* a technical book—merely a general treatment graphically illustrating the part plastics can play in your production and sales picture. An invaluable addition to your data files in promoting—intelligently—the wide use of these materials, rather than promiscuous specification without regard for adaptability.

You will find your copy helpful—write for it today.

MACK MOLDING COMPANY, INC.,
150 Main Street, Wayne, New Jersey.

mack MOLDED EXCELLENCE

SALES OFFICES: NEW YORK CITY, CHICAGO, DETROIT, INDIANAPOLIS, BOSTON & ST. LOUIS

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YOUR PRODUCTS should be SEEN and not HURT



Here is a photographic story of LUSTEROID'S light weight. Three of these smart containers weigh the same as one of the former packages replaced by LUSTEROID.



With LUSTEROID, your design and sales message are reproduced in full color to become an integral part of the container No labels to buy or affix.

DISTINCTIVE *LUSTEROID* VIALS AND TUBES DISPLAY AS WELL AS PROTECT

Here is a proved method of packaging that does two vital jobs in one:

1. LUSTEROID displays your products through its crystal-clear walls for eye-and-buy appeal.
2. LUSTEROID'S strength, rigidity and "unbreakability" protect your products from damage and soil in shipment, at point of sale and in use.

These plastic containers save time, work and money. Their inherent strength eliminates the need for protective packing in shipment. Their printability means no labels to affix. Their light weight cuts shipping costs.

LUSTEROID comes in all colors of the rainbow—clear or opaque—with cork, slip-on or screw-cap closures. Standard diameters from ¼" to 1¼" and lengths up to 6".

For safety, smartness, savings and sales, merchandise and protect your products in LUSTEROID.

Write for post-war details

LUSTEROID CONTAINER COMPANY, INC.

Formerly Lusteroid Division of Sillcocks-Miller Company

Office and Factory: 10 W. Parker Avenue, Maplewood, N. J. • Mailing Address: South Orange, N. J.

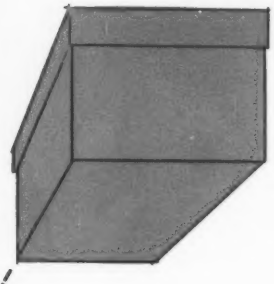
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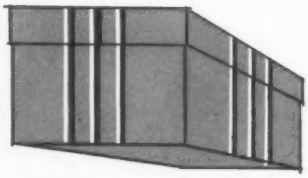
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3 ways to put PUNCH into your packages

MOLD THEM FROM PLASTICS...

For lowest cost in large quantities, highest production speed, greatest choice of colors and effects—mold your packages from cellulose acetate or ethyl cellulose! Tough, featherweight, stable over a wide range of temperatures or exposures to moisture and chemicals, these molding materials are the most useful and economical of all plastics.



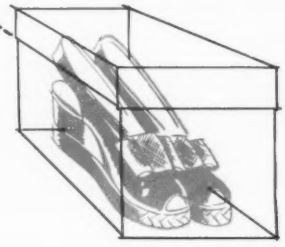


COAT THEM WITH LACQUER...

Where a paper or paperboard package is adequate, take a tip from canners who beautify and protect their labels with clear lacquer! Nitrocellulose lacquer is the fastest-drying finish known. It repels moisture, grease, most acids and alkalies. Hard, tough, and flexible, lacquer adds enduring brilliance to any paper container.

FORM THEM FROM PLASTIC SHEETS...

If you would like a crystal-clear, shatter-proof package for your products—without the initial cost of molds—specify cellulose acetate sheet! Ideal for small-run jobs, these sheets are readily sheared, stamped, bent, swaged, embossed, and cemented together. Labels and designs are easily printed on.



Hercules does not make plastics or lacquers, but supplies the high-quality cellulose derivatives from which they are made. For data, please write to...



HERCULES POWDER COMPANY
INCORPORATED
931 Market Street, Wilmington 99, Delaware

HERCULES

CELLULOSE ACETATE
CELLULOSE NITRATE
ETHYL CELLULOSE

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PUT YOUR PRODUCT IN THIS PICTURE!

HERE'S A GALLERY of famous products—a mere few out of the thousands of sales leaders packaged with BAKELITE phenolic and polystyrene plastics in prewar days. And now these modern packaging materials are again imparting their superlative protection and eye-appeal. Adopt them for your products and you'll be enrolled in the company of distinguished names that enjoy the fastest turnover in retail outlets.

BAKELITE plastics for closures and packages come in brilliant and pastel hues to harmonize with every color scheme—and they're transparent, translucent, or opaque. They can be molded in smart standard designs for utmost economy; and the variety of special designs is, of course, unlimited. Your product's name, initials, or trade-mark can be permanently embodied in the molding as a reminder of its identity each time it is used. And, closures and packages of BAKELITE plastics are strong, lightweight, non-absorbent, dimensionally stable, impervious to most chemicals and acids, and they retain their good looks indefinitely.

Write Department 124 for Booklet G-8 for detailed information on BAKELITE phenolics, polystyrenes, and many other types of plastics marketed by Bakelite Corporation for packaging purposes.

BAKELITE PLASTICS

TRADE-MARK

TRADE-MARK

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 EAST 42ND STREET, NEW YORK 17, N.Y.



This film's a *TROUBLESHOOTER*

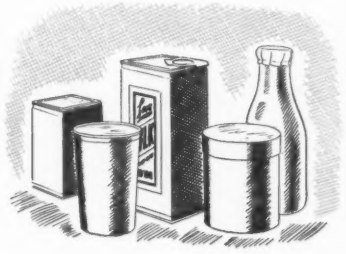
You won't choose VINYLITE cast foils for the *ordinary* wrapping job. This is no *ordinary* film—it has the strength, stanchness, and stamina for top protection where the going's tough. The frozen food industry, for instance, will find it unrivalled; immune to water and low temperatures. It's your outstanding safeguard against oils, alcohols, alkalies, oxidizing agents, and most inorganic acids. And while its characteristics can be varied to meet special requirements, *all* VINYLITE cast foils have exceptional clarity.

You can obtain VINYLITE cast foils in either plasticized or unplasticized form. Plasticized, they have the tear strength and elongation properties that bring exceptional toughness and flexibility. The unplasticized foils have high tensile strength and, of course, more rigidity. Between them, you've modern packaging materials for wide fields of service. They make strong windows for boxes . . . superior pressure-sensitive tapes . . . heat-sealing lamination films for protecting and reinforcing paper and cloth.

VINYLITE
TRADE-MARK
PLASTICS



30,000 PRODUCTS are safeguarded by liners made of VINYLITE resin-coated paper! From cold creams and pharmaceuticals to mayonnaise and soft drinks, they help prevent loss, contamination, and deterioration. Paper liners coated with VINYLITE resin are tasteless and odorless—remarkably resistant to moisture, alkalies, oils, alcohols, and most acids—so versatile that they meet a variety of packaging needs; enable you to reduce inventories and costs.



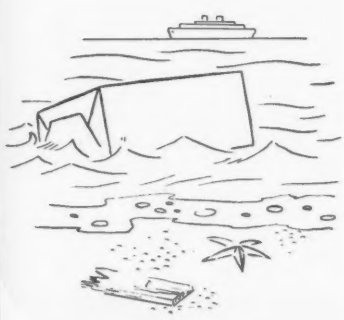
THEY'RE TASTELESS, THEY'RE ODORLESS—two reasons why adhesives properly formulated with VINYLITE plastic resins are ideal sealers for paper containers for foods and beverages. What's more, they provide stronger bonds—bonds that don't weaken with age or long exposure to ultra-violet rays. And adhesives made with VINYLITE plastic resins may be applied by roll-coating, dipping, or brushing methods, and are adaptable to cold-setting and heat-sealing techniques.

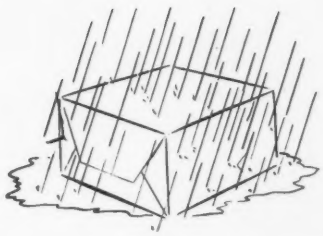


BAKELITE CORPORATION OFFERS YOU the benefit of its vast experience in the packaging field, through its literature, and the cooperation of its development laboratories and field representatives. This service has helped thousands of manufacturers find the best means of safeguarding and displaying their products. Write Department 125 for any packaging assistance you may desire.

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 EAST 42ND STREET, NEW YORK 17, N.Y.

new reasons why you should see Monsanto first for packaging plastics





Monsanto, long a leader in supplying beautiful, useful consumer-appeal packaging materials . . . is now prepared to do just as thorough a job where the accent is on *protection*, e. g., providing moisture barriers, grease resistance, water resistance, resistance to aging and wear.

Most of these latter products were developed by war demand . . . have been proved in war service . . . and are now converted, or are being converted rapidly, to civilian jobs. They include:

- ***Heat sealing coatings for lead-foil* kraft paper composite wrapping material . . . Heat sealing coatings for aluminum foil as well as laminating adhesives for foil-to-foil and foil-to-paper composites.**
- ***Water emulsion coatings and adhesives.***
- ***Synthetic resins for application to paper and paperboard* for improved scuff resistance, water and moisture resistance, as well as greaseproofness.**

More developments are on the way. Manufacturers, paper converters, packaging fabricators . . . you can now consider Monsanto your plastics headquarters whether you're looking for decorating or functional packaging. Complete information at all times is yours for the asking: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts.

VUEPAK
TRANSPARENT PACKAGING MATERIAL

MONSANTO
PLASTICS
SERVING INDUSTRY...WHICH SERVES MANKIND

The broad and versatile family of Monsanto Plastics includes: Lustron polystyrenes • Cerex* heat resistant thermoplastics • Vinyl acetals • Nitron* cellulose nitrates • Fibestos* cellulose acetates • Thalid* for impression molding • Resinox* phenolics • Resimene* melamines. Forms in which they are supplied include: Sheets • Rods • Tubes • Molding Compounds • Industrial Resins • Coating Compounds Vuepak* rigid, transparent packaging materials.*

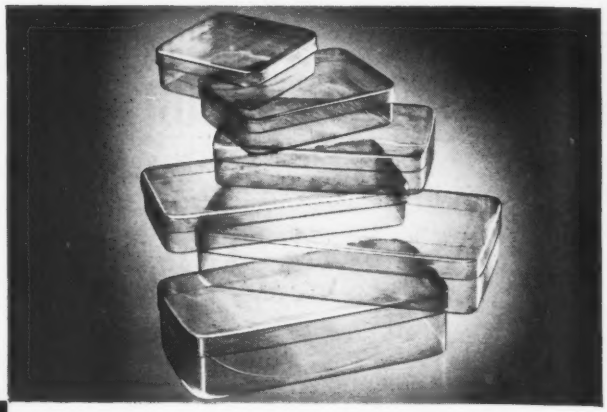
*Reg. U. S. Pat. Off.

(See special pages of information on Vuepak and Lustron in this catalog.)

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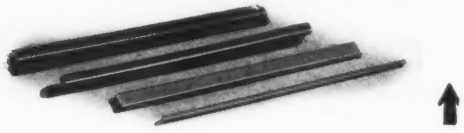
Better PLASTICS BY NEWEST METHODS

Look to "Great American" for help in plastics for packaging, blown ornaments and toys, molded consumer and industrial items. Our wealth of experience, our complete variety of plastic processes and our professional experience are always at your command. Check these types of plastic processing for YOUR needs — then wire, write or phone GREAT AMERICAN.



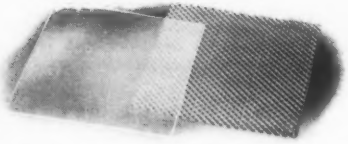
Drawn transparent plastic boxes—with or without special compartments. Used widely by Army, Navy, Marine Corps and Industry. Peacetime possibilities are only limited by your merchandise.





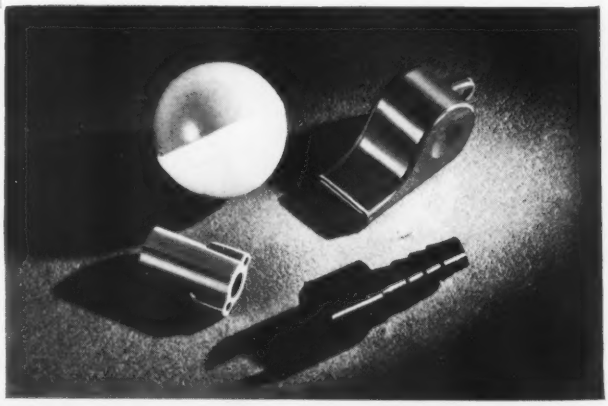
Extruded rods and tubing — available in an endless variety of shapes and diameters, stock and custom profiles for architecture, furniture, etc. etc.

Blown articles in intricate forms and shapes can be obtained.



Sheet plastics. Opaque — colored or clear transparent—plain or in three dimensional embossed patterns integrally applied.

Molded Plastics — representative of just a few of the shapes—sizes and color combinations possible with our up-to-date molding machinery.



THE GREAT AMERICAN PLASTICS CO.

• INJECTION • EXTRUDING • BLOWING • FORMING • SHEETS • ROD-TUBES AND SPECIAL SHAPES •

TELEPHONE: FITCHBURG 5300 **FITCHBURG, MASSACHUSETTS** TELETYPE: FITCHBURG 295

NEW YORK CITY SALES AGENCY: 27 WEST 20th STREET • WATKINS 9-6968

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From A to Z

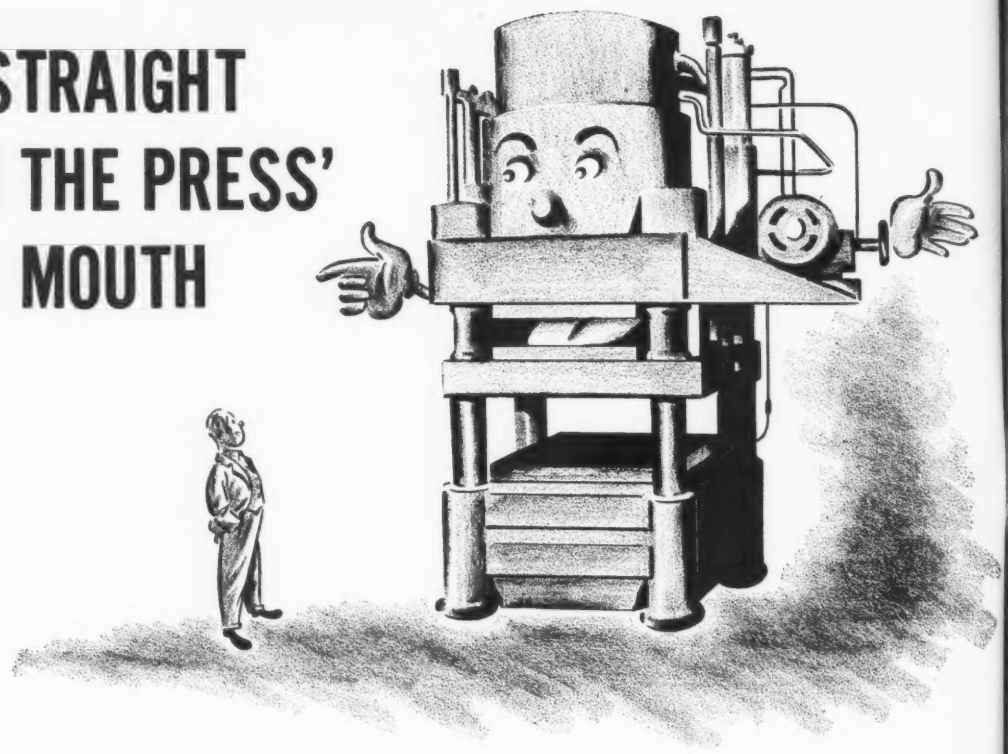
... we are in a position to serve your plastic needs. From selection of the proper plastic materials through the various phases of designing, engineering, tooling, and moulding, we offer a complete service. For post-war plastics think of Bridgeport.

BRIDGEPORT MOULDED PRODUCTS, INCORPORATED

BRIDGEPORT CONNECTICUT

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STRAIGHT FROM THE PRESS' MOUTH



Maybe you don't think a molding press can talk?

We would like to introduce one of ours—it's got more brains than we have, sometimes. It's an automatic robot we designed and built ourselves. You put powder in at one end, fix the molds in place, set the cycles, and it will turn out literally millions and millions of pieces without pause as long as you keep feeding it powder.

Matter of fact, we were talking to the press only the other day. It was rather a one-sided conversation—the press did most of the talking. It said, "How about some packaging work? I don't want to get typed on straight industrial applications. A press can go stale just like anybody else, you know, if it doesn't get some variety."

"Is that so?" we asked weakly.

"Yes, that's so," the press replied. "Why don't you get after some of your packaging customers and tell them how many closures we can turn out, how cheaply, for instance, and tell them about some of the other machines we have around here, too. How they can make boxes and other kinds of packages and maybe some novelties and other things that packagers can use."

"But," we replied even more weakly, "we're all so busy these days."

"Busy, busy," the press said, "that's all I ever hear. I want some variety in my life and you better get after those packaging industries pretty quick or else I will just quit on you!"

So we said we would and we are.

We will be glad to mold your plastics in any shape or form and we will do our d—dest to give you service in spite of material shortages and other problems.



Our little book "A Ready Reference for Plastics" will give you some straight talk on what plastics are, how they are handled, etc. Free to interested companies.

BMCO

ARMY E NAVY

BOONTON MOLDING COMPANY

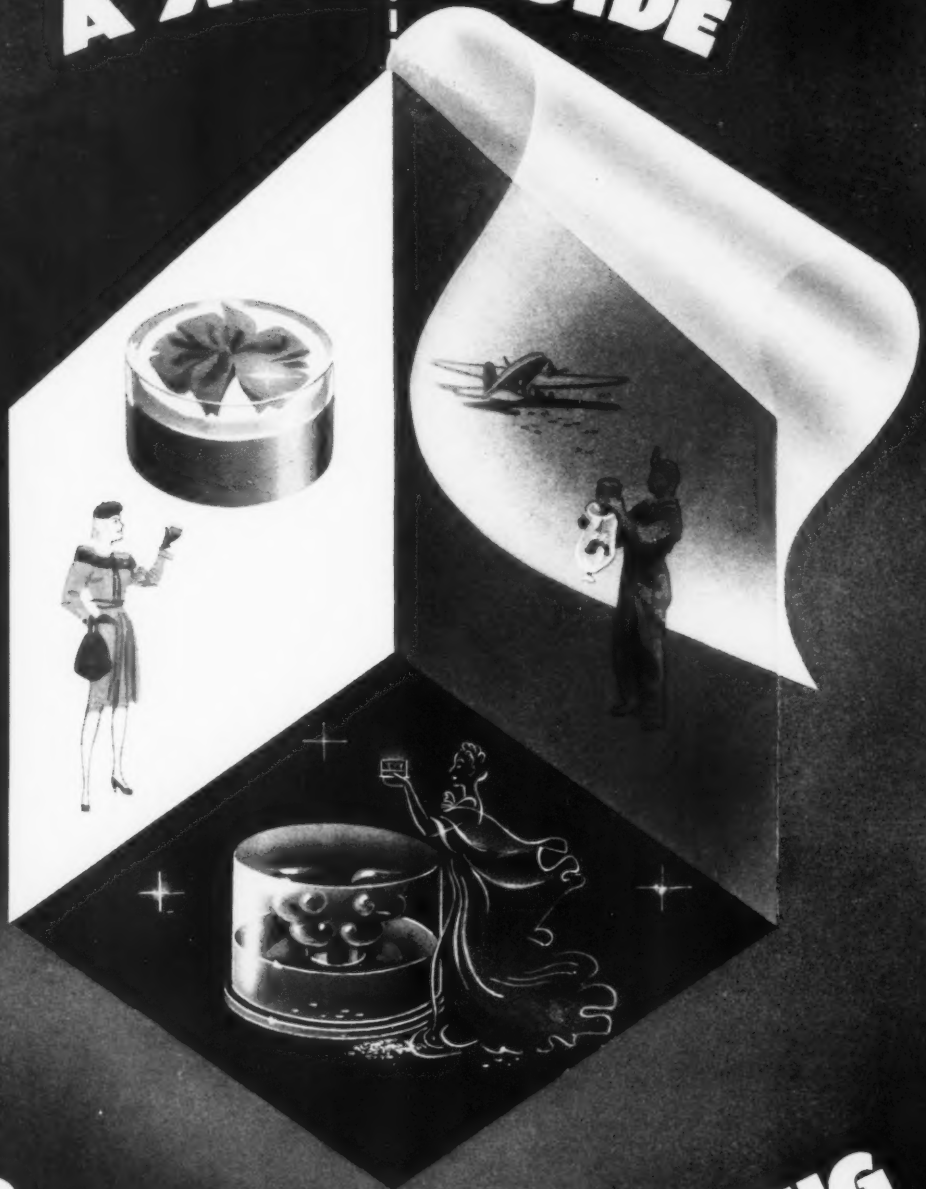
MOLDERS OF PLASTICS · PHENOLICS · UREAS · THERMO-PLASTICS

BOONTON · NEW JERSEY · Tel. Boonton 8-2020

NEW YORK OFFICE

Chanin Bldg., 122 East 42nd Street, New York 17, N. Y., MUrray Hill 6-8540

A SHORT GUIDE



TO BETTER PACKAGING

DOW



Dow-developed protective solves the moisture problem

The question "What packaging film shall I use?" should be answered by the selection of that material which most nearly fits *all* specific needs. Tough, flexible Saran Film has been developed by The Dow Chemical Company as a transparent packaging medium of "balanced" characteristics. And it has the especially valuable ability to "keep moisture in its place" over unusually long periods. Whether moisture is to be kept out of the package or retained inside, Saran Film is provedly superior, even under the extremes of climatic conditions encountered in present-day global transportation activities. As time goes on, more and more packaging users and fabricators will avail themselves of the numerous features offered by Saran Film.

XUM

HOW AND WHERE TO USE SARAN FILM



Packaging of precision metal products and parts for shipment or storage requires the use of the right *methods* and the right *materials*. The efficiency of a correctly engineered package is only as good as the moistureproofness of the film barrier. Saran Film has an extremely low moisture vapor transmission rate . . . requires only small amounts of desiccant . . . is tough, but pliable . . . won't crack or become brittle with age . . . affords efficient protection over extended periods of time.

While Saran Film is being devoted outstandingly to the protection of precision metal parts, constant research is suggesting great opportunities for widespread usage of its individual advantages in varied packaging fields where freshness of product and the appeal of appearance are important considerations. Laboratory tests indicate Saran Film to be ideal for those who take pride in guaranteeing that the quality of their product has complete protection up to the very moment it reaches the consumer.

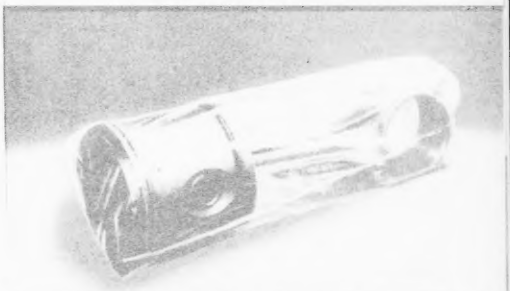
SARAN FILM PROPERTIES AT A GLANCE

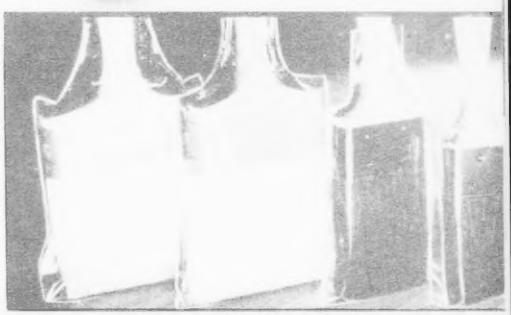
Saran Film is a thermoplastic . . . basically a vinylidene chloride resin. It is extra tough, clearly transparent . . . flexible, even at low temperatures . . . free of fire hazard. Its notable ability to "keep moisture in its place" is retained—even improved—with age. And Saran Film is highly resistant to the attack of almost every chemical combination: acids, alkalies, organic solvents, salt solutions. You are invited to consult Dow regarding additional details.









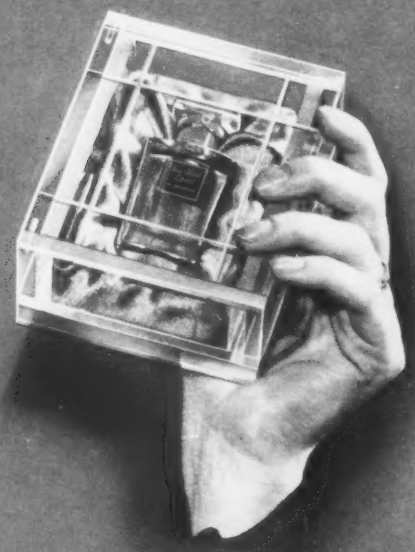


Saran Film is widely used in industrial packaging and other forms of moistureproof protection. Shown in the photographs, beginning at top, are a carburetor, a micrometer, an electric motor, a piston, and paint brushes enclosed in Saran Film. The carburetor and motor are inserted in a Saran Film bag and bolted to a base . . . gaskets around the bolt-holes form a moisture-tight seal . . . the sealed envelope gives complete protection.

DOW

STYRON

Molded Beauty



Brilliant new attractiveness for the finest products

Because of its striking brilliance and clarity, Styron is increasingly demanded as a packaging material for smart merchandise. Styron ably performs the double function of protecting fine products and stimulating sales. Its magnetic appeal stands out in any array of goods . . . lends glamour at the point of sale. Molded Styron containers are valued for themselves, too, long after the original product has been used. Styron containers find secondary uses as cigarette, powder or jewelry boxes. Styron's properties also recommend it for use in making boxes, bottles, and closures for pharmaceuticals. It has negligible water absorption, is resistant to acids and alkalies, and is stable at low temperatures.

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HOW AND WHERE TO USE STYRON



Fine products that demand the utmost in sparkling beauty as well as protection call for the use of Styron molded containers. Styron's use is particularly recommended for the packaging of perfumes, lipsticks, face powders, and a wide group of other cosmetic and specialty products that face sharp competition in the eye-arresting appeal of the package . . . Styron's broad resistance to chemicals and low moisture absorption make it readily adaptable to pharmaceutical containers of all sizes and types. It is especially fitted for making bottles, boxes, closures, and funnels that come into contact with liquids and solids of many chemical makeups. Its dimensional stability at low temperatures gives it a special recommendation for drug and medicine containers that must be refrigerated. Styron is a thermoplastic which may be fabricated by either injection or compression molding. It provides quick mold release without lubrication of molds. It buffs well, with little tendency to scuff or "burn." It offers good flow, fills thinner sections.

STYRON PROPERTIES AT A GLANCE

Styron (Dow Polystyrene) has an extremely low specific gravity (1.05-1.07), which means that it gives more moldings per pound and the utmost in manufacturing economy. It is available in clear, translucent or opaque form. It has unlimited color adaptability. Styron's resistance to acids and alkalies, its dimensional stability, even at low temperatures, and its low water absorption, make it applicable to the packaging of many products.

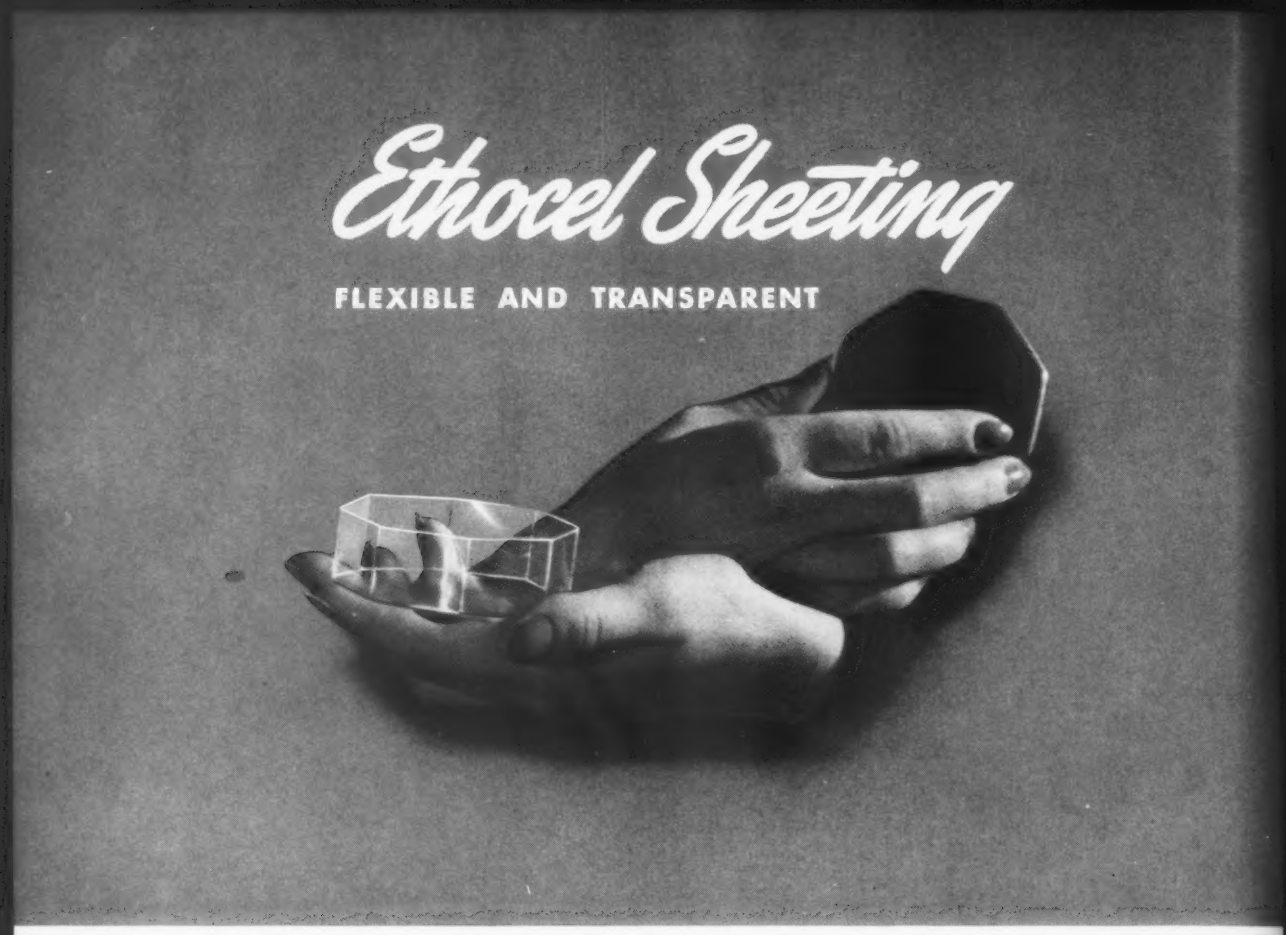




Styron contributes beauty and utility to many types of packaging. Top—Styron cover adds sales appeal to decorative pasteboard powder box. Center—Pleasing and serviceable bottles and closures, clear or in colors, are made of Styron. Bottom—Beauty of Styron makes perfume box (facing page) doubly valued for secondary use as cigarette box.

DOW

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Rigid transparent packaging with smart sales appeal

In the past many packaging users have been inclined to look upon all transparent rigid plastic sheeting as being substantially alike. But as the use of this type of material has expanded, it has been demonstrated in actual performance that Ethocel Sheeting—Dow Ethylcellulose—for very specific reasons is truly outstanding. Its strength and ductility . . . its essential property of retaining all its serviceability and fresh sales appeal under the most adverse conditions of handling and shelf-wear and temperature extremes . . . the practical ease with which it is formed . . . the wide variety of its possibilities for shaping and conjoining . . . the low cost of its fabrication—all these advantages, plus many more, mark Ethocel Sheeting for successful use where other materials may fail.

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HOW AND WHERE TO USE ETHOCEL SHEETING



The general uses of rigid transparent sheetings are well known. They are utilized in widely variegated types of merchandising and protective packaging, ranging from humidity indicators to rare orchids and other delicate products requiring both visual and protective aid. In a great many instances Ethocel Sheeting offers qualities and advantages not found in any comparable sheeting substance.

ETHOCEL SHEETING PROPERTIES AT A GLANCE

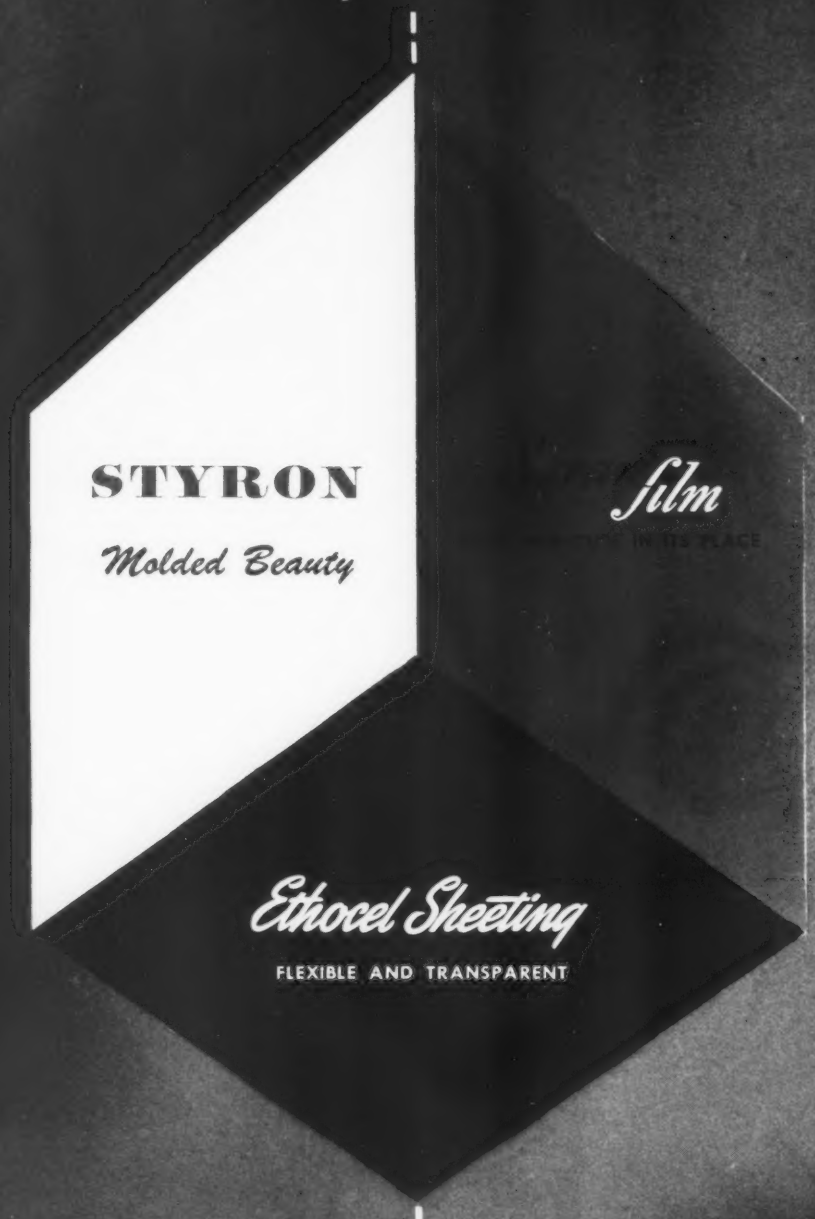
Ethocel Sheeting, cast from Dow Ethylcellulose, is excellent in both impact and tensile strengths, and remains unchanged within a range of temperatures from −70° to 250° F.! Its inherent pliability permits bending, forming and deep-drawing into seamless ovals, circles, hemispheres, oblongs; and cylinders can be drawn to depths as much as two-thirds the diameter. Ethocel Sheeting can be continuously beaded, crimped, scored, creased, or folded through beaded edges. Cementing, riveting, sewing and stapling are all cheaply practicable. When subject to any of these operations, Ethocel Sheeting will retain intact all the appeal of its brilliant luster and fine clarity. Under long exposure to strong light in show-windows or display counters, Ethocel will not discolor or become brittle. It will take printing in any ordinary technique, and it can be finished in high gloss or rich matte, in an extensive range of colors, in translucent or opaque forms as well as transparent. Complete information relative to Ethocel's application may be had by writing Dow.



These examples of Ethocel Sheeting fabrications illustrate uses of such operations as beading, cementing, printing, and combining with other materials. The humidity indicator (bottom) is a practical application of Ethocel Sheeting, often used as an additional safeguard in Method II packaging (See Saran Film section).

DOW

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The Dow Chemical Company

MIDLAND, MICHIGAN

New York • Boston • Washington • Philadelphia • Cleveland
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Los Angeles • Seattle



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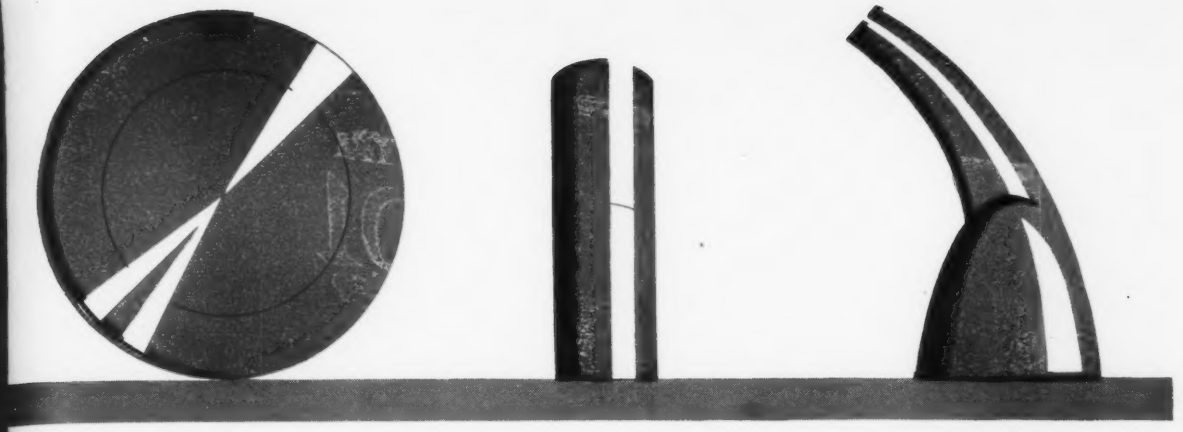
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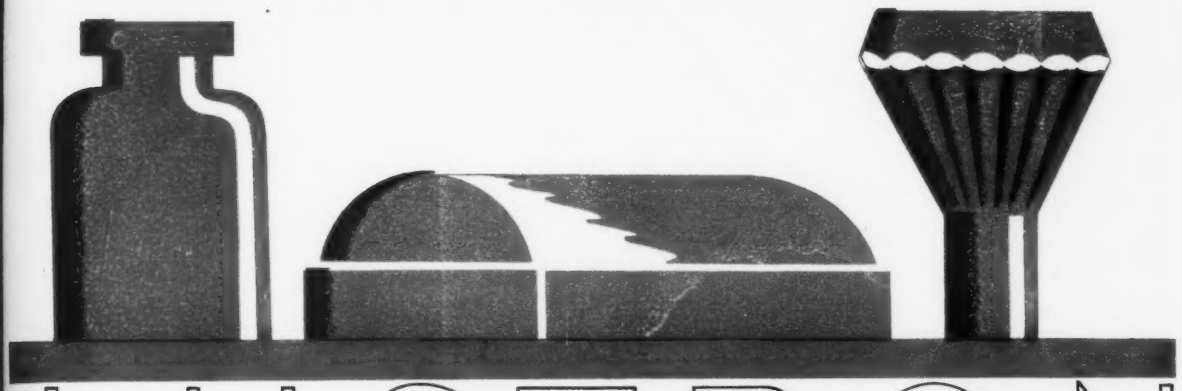


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IN LUSTRON

your product becomes luxurious without becoming expensive....

With your product must you attract both style-wise and bargain-wise shoppers?

Then give first consideration to Monsanto's polystyrene, Lustron... for beautiful, low-cost molded containers, packaging components, decorative caps and closures, dispensers, blown bottles, premiums, high style displays, and re-use containers.

Here's a check list of Lustron advantages for comparison with any material you may have in mind.

1. **Lustrous, gem-like surfaces.**
2. **Full color range . . . from crystal transparent, through pastels to rich opaques.**
3. **Best dimensional stability.**
4. **Pleasant to the touch . . . smooth, low thermal conductivity.**
5. **Strong . . . especially at low temperatures.**
6. **Resistant to alkalies, alcohol, common acids . . . and water.**
7. **Does not absorb or impart odors or taste.**
8. **Economy—low in cost per pound . . . light in weight (more units per plastic dollar) . . . and molded by fastest, most economical methods.**

VUE-PAK
TRANSPARENT PACKAGING MATERIAL
TRADE MARK

MONSANTO
PLASTICS

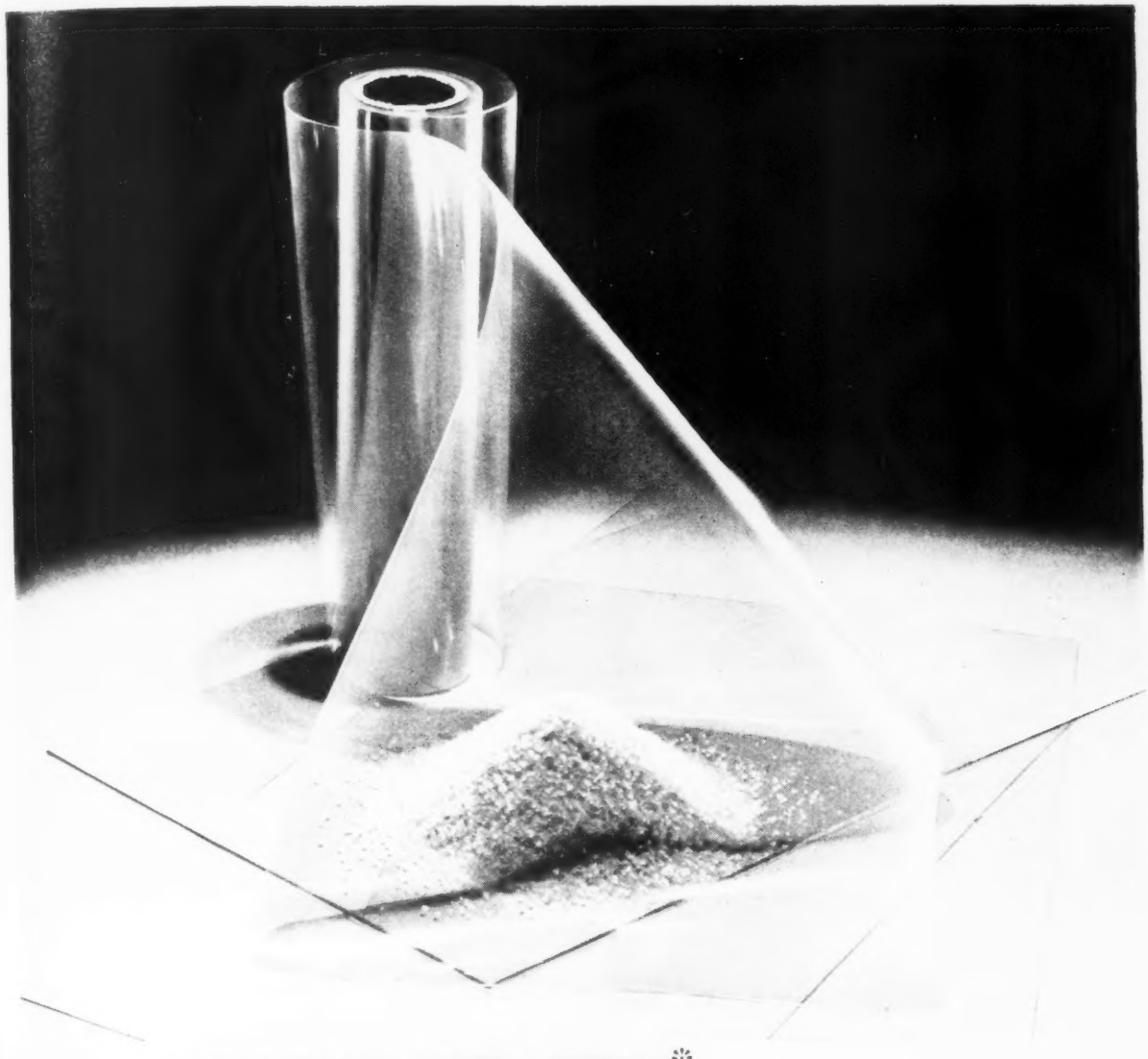
If you want to achieve unsurpassed luxury appeal at bargain basement costs, investigate Lustron fully for your packaging, display and promotional material. Experienced Monsanto packaging consultants are ready to give you every help... and complete technical data on Lustron is yours for the asking... simply address: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts. District Offices: New York, 30 Rockefeller Plaza; Los Angeles, 605 West Olympic Blvd.; Detroit, 727 Fisher Bldg.; St. Louis, Paul Brown Bldg.; San Francisco, 100 Bush St.; Chicago, 1517 Tribune Tower; Montreal, 478 St. Paul St. West; Toronto, 183 Front St. East.

The board and versatile family of Monsanto Plastics includes: Lustron polystyrenes • Cerex* heat resistant thermoplastics • Vinyl acetals • Nitron* cellulose nitrates • Fibestos* cellulose acetates • Resinox* phenolics • Resimene* melamines. Thalid* for impression molding. Forms in which they are supplied include: Sheets • Rods • Tubes • Molding Compounds • Industrial Resins • Coating Compounds Vuepak* rigid, transparent packaging materials.*

**Reg. U. S. Pat. Off.*


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EGGNOG
SHAMPOO

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LUMARITH* A CELANESE* PLASTIC

LUMARITH is *"way-out ahead"* in consumer appeal. Its sparkling transparency gives showcase attractiveness to shelf and counter products. Lumarith-packaged merchandise—visible to the eye, free of contamination and shopwear—carries its own sales message.

Lumarith in transparent films, sheets and colorful molding materials is a complete and versatile packaging plastic for: transparent wraps and bags, laminated and window boxes, rigid transparent and spiral wound containers, drawn, formed and molded containers.

In your merchandising program you will find many opportunities to use Lumarith. Your plans for better products and greater sales should take into account the tremendous sales-persuasion of this modern packaging plastic. Celanese technical service staff is prepared to supply you with new and informative packaging data. Celanese Plastics Corporation, a division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y.

SEE OTHER LUMARITH ADVERTISEMENTS
PAGES 192-3, 269, 669

WRITE FOR PACKAGING BOOKLET

Celanese Plastics Corporation, a division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y.

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"The Gem of Plastics"

Catalin

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Catalin is one of the early plastic materials.

Catalin, by reasons of its qualities and an ever mounting consumer acceptance has found its way into many and greatly diversified types of products, both decorative and functional.

Much credit is due Catalin for the development of the split-mold and cored-mold casting techniques, making it possible to reproduce in this material highly involved designs.

Today, and apace with the industry's growth, the name *Catalin* encompasses a notable family of plastic materials—cast resins, liquid resins, molding compounds.

The October 1945 issue of MODERN PLASTICS carried Catalin's 162nd consecutive message.

MODERN PLASTICS MAGAZINE

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. . . the only ABC plastics paper . . . the field's established institution . . . one of America's great industrial publications

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Plastic Container

You get more for your money with CLEARSITE. In eye-appeal, shatterproof protection and in operating economies CLEARSITE has demonstrated in many fields its outstanding values as a *better* container.

SHATTERPROOF SEAMLESS COLORFUL
FEATHERLITE *imprinted during manufacturing process.*

Available in any colors and in all sizes—3/8 to 1-3/4" diameters. In various lengths to meet requirements. CLEARSITE can be supplied to fit countless sales problems. Our Package-Design Staff will gladly submit suggestions.

CLEARSITE — made of Cellulose Acetate — Safety Base

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COSMETICS
TOYS
HARDWARE
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MACHINE PARTS
TOOLS
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PLASTIC CONTAINERS
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NEW YORK OFFICE—630 FIFTH AVENUE WEST COAST: CONTAINER SERVICE COMPANY, LOS ANGELES 27 CAL

For proven craftsmanship in Plastic Design and Custom Injection Molding Consult

CONTINENTAL
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Functional Product Design



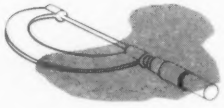
With complete knowledge of the characteristics and properties of thermoplastic materials, Continental designers create plastic products and parts superior in every respect. Plans are conceived to assure clients utmost efficiency, appearance, durability and sales appeal.

Engineering



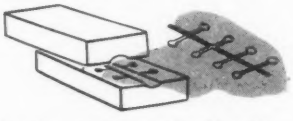
Continental engineers, with a highly technical understanding of the plastics industry, are responsible for the correct application of design principles in basic material selection and molding technique. Competent and thorough laboratory analysis is employed throughout every stage of the process.

Precision Mold Making



The master craftmanship of expert tool makers is applied to the making of quality injection molds faithfully conforming to design specifications. Precision mold design at Continental is responsible for economical and uniformly perfect castings of your plastic product.

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Engineering excellence and mold-making proficiency are followed up by skilled press operators to produce efficiently-fabricated castings. Through the coordination of feed, temperature, and pressure, the most rigid specifications are observed. A system of continuous inspection is assurance of perfection.

Final Stages



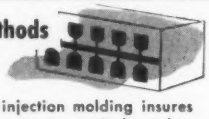
Minute inspection of every plastic casting by trained workers is your safeguard of quality. Utilizing the most modern machinery obtainable, mechanical tests are made, special machining, assembling and finishing operations executed.

Materials



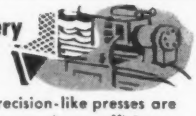
All types of thermoplastics are available in a broad range of grades and colors for application to your product.

Methods



Custom injection molding insures faster, more economical production — plus superior results in appearance and performance.

Machinery



Hi-speed, precision-like presses are designed for maximum efficiency, produce castings remarkable for beauty and durability.

Send or bring in your blueprints or sample products, or ask for a representative to call

cpc CONTINENTAL *Plastics Corporation*

308-314 West Erie Street • Chicago 10, Illinois

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PLASTICS



WATERBURY Moldings of Merit

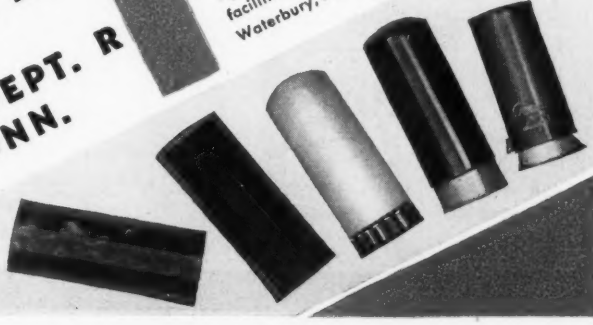
In the design and production of Plastic Containers, Waterbury Companies has available technical experience and mechanical skill seldom found in a single organization. This is a tremendous advantage to a manufacturer of a cosmetic or toiletry product where packaging costs must be kept at a minimum without sacrifice of style, strength and operational convenience.

Many world famous products are packaged in Waterbury Moldings of Merit. We invite inquiries from manufacturers who have a container problem to solve. Our engineers, chemists and production experts will gladly advise you as to the most economical and efficient way to create the most suitable and attractive type for your product.



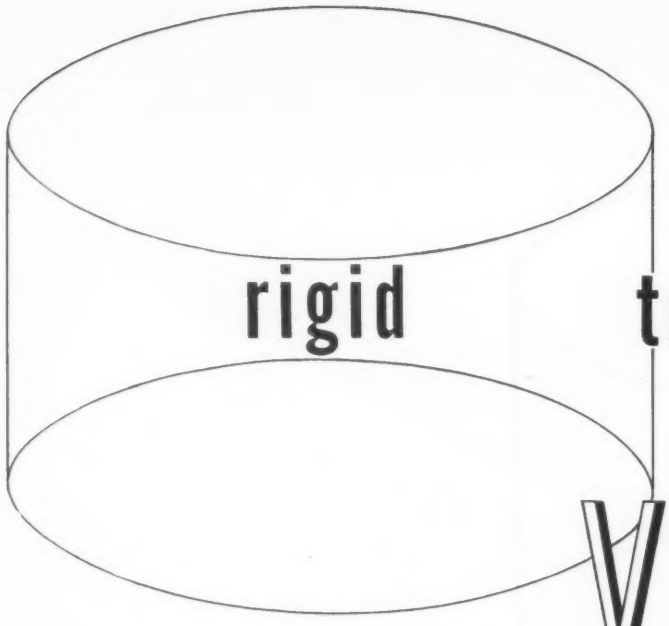
Waterbury Companies, Inc., serves American industry with a diversified range of plastic products . . . from the simplest electrical part to the most intricate custom-molded device; combining plastics with metal inserts when required. Six complete manufacturing divisions, three laboratories and facilities for large scale production. Remember Waterbury, when you need plastics for any purpose.

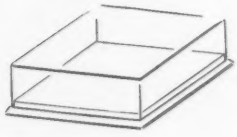
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WATERBURY, CONN.



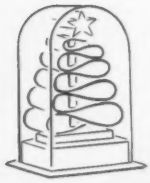
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Vuepak* questions and answers

1. What is Vuepak?

Vuepak is a transparent, tough, rigid, beautiful Monsanto cellulose acetate.

2. In what form is Vuepak available?

In sheets up to 30″ wide, and in continuous rolls 30″ wide up to 1000 ft. long, depending upon thickness.

3. In what thicknesses is it ordinarily available?

In six standard gauges 0.005″ to 0.020″.

4. Does sunlight affect it?

No.

5. Is it affected by heat?

Not under ordinary temperatures. It begins to soften after 200°F. Underwriters' Laboratories classification, "slow burning."

6. How can it be fabricated?

It can be drawn, shaped, formed or folded into almost any shape with inexpensive dies. It can be embossed, stapled, printed, cemented, or combined with other materials.

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the super "eye-way" to new sales records in 24† different fields

†Some but not all of the fields in which Vuepak packages have demonstrated themselves as definite sales stimulators.

1. Auto accessories
2. Baby gifts
3. Baked goods
4. Blankets, towels, etc.
5. Cameras, optical goods
6. Candies, nuts
7. Cigars, tobacco
8. Clothing, haberdashery
9. Condiments
10. Cosmetics
11. Displays
12. Drugs, toilet goods
13. Electrical appliances, parts
14. Flowers
15. Games, toys
16. Hardware, household goods
17. Jewelry
18. Liquors
19. Novelties, notions
20. Pens, pencils, stationery
21. Pipes, smokers' supplies
22. Shoes, slippers
23. Sporting goods
24. Watches, instruments

*VUEPAK: Reg. U. S. Pat. Off.

Quickest . . . and therefore the most profitable . . . route to the buyer's pocketbook is *via the eye*. (It's through the eye, psychologists say, that the brain receives 85% of its impressions.)

So *The View* is Reason No. 1 why Vuepak is used by so many successful merchandisers: Vuepak reveals all the product's allures to full advantage . . . color, texture, freshness, form and beauty.

But Reason No. 2 is equally important: *Rigidity*. The contents of a Vuepak package are not only fully displayed, they are also fully *protected* and *preserved*. The individual Vuepak "showcase" is not a bag, but a box, offering real physical protection and furnishing a barrier against soiling, fingering and shelf-staling.

Retailers co-operate on Vuepak'd merchandise because they know the sparkling, transparent boxes really cut *their* costs . . . reduce selling time and expense per unit, protect against shopwear, they stack and display better, command firm, quality prices. And the re-use value of Vuepak always proves an added sales factor.

Vuepak is again resuming its leading position in the rigid, transparent packaging material field, war improved and with new low cost fabricating techniques to recommend it. Monsanto packaging consultants are ready to work with you, your box supplier or fabricator, or your box designer adapting Vuepak to your merchandising opportunities. Full information is yours for the asking. Write, wire or phone: MONSANTO CHEMICAL COMPANY, Plastics Division, Springfield 2, Massachusetts. District Offices: New York, 30 Rockefeller Plaza; Los Angeles, 605 West Olympic Blvd.; Detroit, 727 Fisher Bldg.; St. Louis, Paul Brown Bldg.; San Francisco, 100 Bush St.; Chicago, 1517 Tribune Tower; Montreal, 378 St. Paul St. West; Toronto, 183 Front St. East.

VUEPAK
TRANSPARENT PACKAGING MATERIAL

MONSANTO
PLASTICS
SERVING INDUSTRY...WHICH SERVES MANKIND

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WHEN you package your products in crystal-clear Eastman Acetate Sheet, you satisfy a fundamental desire of any shopper . . . you *show* your product in its entirety, in all its own beauty . . . in a jewel-like setting as brilliant as light.

Optical clarity, easy forming-properties, toughness, dimensional stability . . . this thermoplastic, cellulose acetate material has all these qualities.

Eastman Acetate Sheet can be drawn, beaded, folded, scored, crimped, stapled, embossed, and joined—with either solvent- or glue-type adhesives.

Beautiful printed effects are readily obtained, and it can be used effectively in combination with other materials.

Now is the time to investigate this extremely clear, brilliantly sparkling material. Eastman Acetate Sheet is supplied in a variety of types, in gauges .003″ and thicker, in sheets and rolls.

CELLULOSE PRODUCTS SALES DIVISION
EASTMAN KODAK COMPANY
ROCHESTER 4, N. Y.

A Summary of Physical Properties

Specific gravity: 1.27-1.34; Tensile Strength P.S.I. (.005″ sheet): 10,000; Water Absorption %, 24 hours immersion: 6.44; Refractive Index: 1.488. **Chemical Resistance:** Only slight effect from weak acids and alkalies. Decomposition results from strong acids or alkalies. **Solubility:** Soluble in ketones and some esters, slightly soluble or softened in alcohols, little affected by hydrocarbons or essential oils. **Effect of Aging:** Only slight yellowing after prolonged exposure to sunlight and atmospheric conditions. **Flammability:** Similar to paper. **Cementing:** There are a number of different types of cements available capable of cementing Eastman Acetate Sheet to itself or to a variety of materials such as paper, wood, rubber, or metals. Solvent-type cements are usually used in fabricating transparent containers. These adhesives result in colorless, optically clear bonds having strength equal to the sheeting itself.

Weight and Area

Figures are approximate

Thickness In Inches	Weight In Pounds Per 20″x50″ Std. Sheet	Area Sq. Inches Per Pound
.003	.1375	7300
.005	.229	4350
.0075	.344	2900
.010	.458	2180
.0125	.573	1750
.015	.687	1450
.020	.916	1090

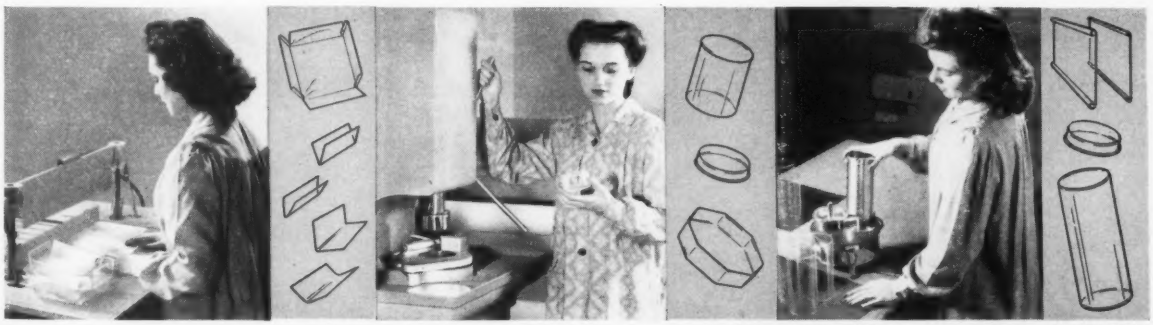
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Kodak Packaging Laboratory is at Your Service

You are cordially invited to make use of the facilities of the Kodak Packaging Laboratory. In this practical workshop, you and your staff can learn the fundamental principles employed in making transparent containers. Here, in pilot-plant surroundings, Kodak technicians will demonstrate the basic fabricating operations—and help you work out your own particular problem. Write for an appointment.

Creasing **Drawing** **Beading**



PHOTOGRAPHS TAKEN IN KODAK PACKAGING LABORATORY

OTHER KODAK CELLULOSE PRODUCTS

Kodapak—Cellulose-ester, transparent sheeting in rolls and sheets. Gauges—.002″ and thinner.

Kodaloid—Clear, transparent, cellulose nitrate sheeting in rolls and sheets. Gauges—.003″ and thicker.

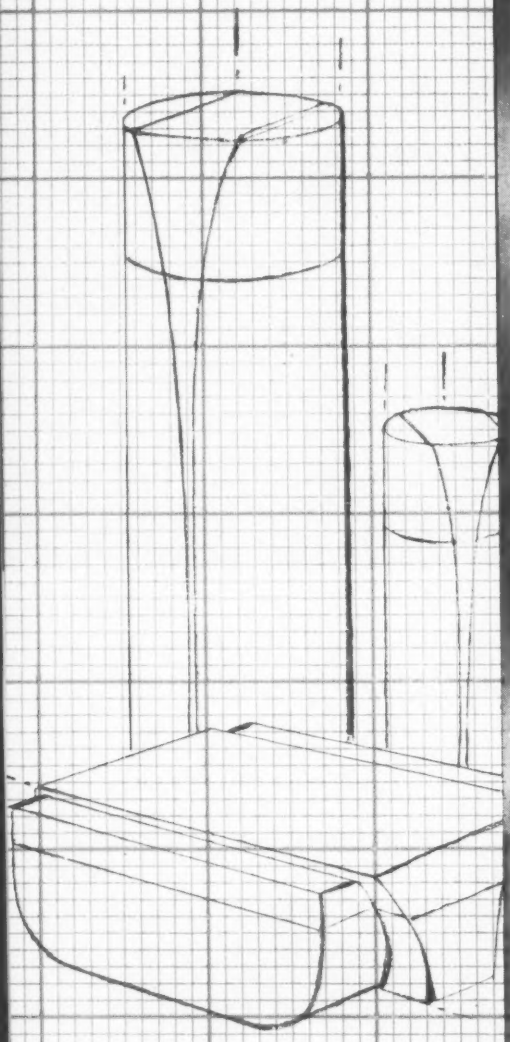
Lacquer Bases—Basic cellulose-ester solutions for manufacture of all types of protective coatings.

Kodak

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DESIGNED AND ENGINEERED AT NO. 1 PLASTICS AVENUE



PLASTICS

the Packaging Plus

● A much wider range of products than ever before now may be merchandised more effectively with colorful and eye-appealing custom plastics packaging. Important production economies have been effected by the development of new techniques in handling versatile plastics materials.

● Now plastics can be recommended for your special consideration in solving new packaging problems.

● General Electric—the world's largest manufacturer of finished plastics products—offers you a *complete* plastics service. And G.E. has gained broad experience from designing and producing many plastics packages from a wide variety of materials.

● You may consult G-E industrial designers, who know modern display and packaging trends. With General Electric's production facilities for all kinds of molding, laminating and fabricating—you may be sure that your packaging design can be carried through to manufacture in any quantity you may require.

● Why not find out if plastics have become practical and economical for packaging your product? Address inquiries to General Electric Co., 1 Plastics Avenue, Pittsfield, Massachusetts.

GENERAL ELECTRIC

CD46-P1



Typical G-E plastics packaging for the cosmetics industry.



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One Medium Reaches All Branches

The medium is MODERN PACKAGING!

Consider the packaging market as a stately *tree*...and look upon its *branches* as the forty-four industries which comprise this market.

Into the roots of this tree MODERN PACKAGING pours the nourishment of its editorial strength. Its influence carries right up through the *trunk* of machinery, adhesives, paper, cardboard, flexible materials, closures, containers, etc. . . . spreads out into all the *branches*—food products, pharmaceuticals, cosmetics, paints, hardware, giftwares, textiles, toys, luggage, etc.

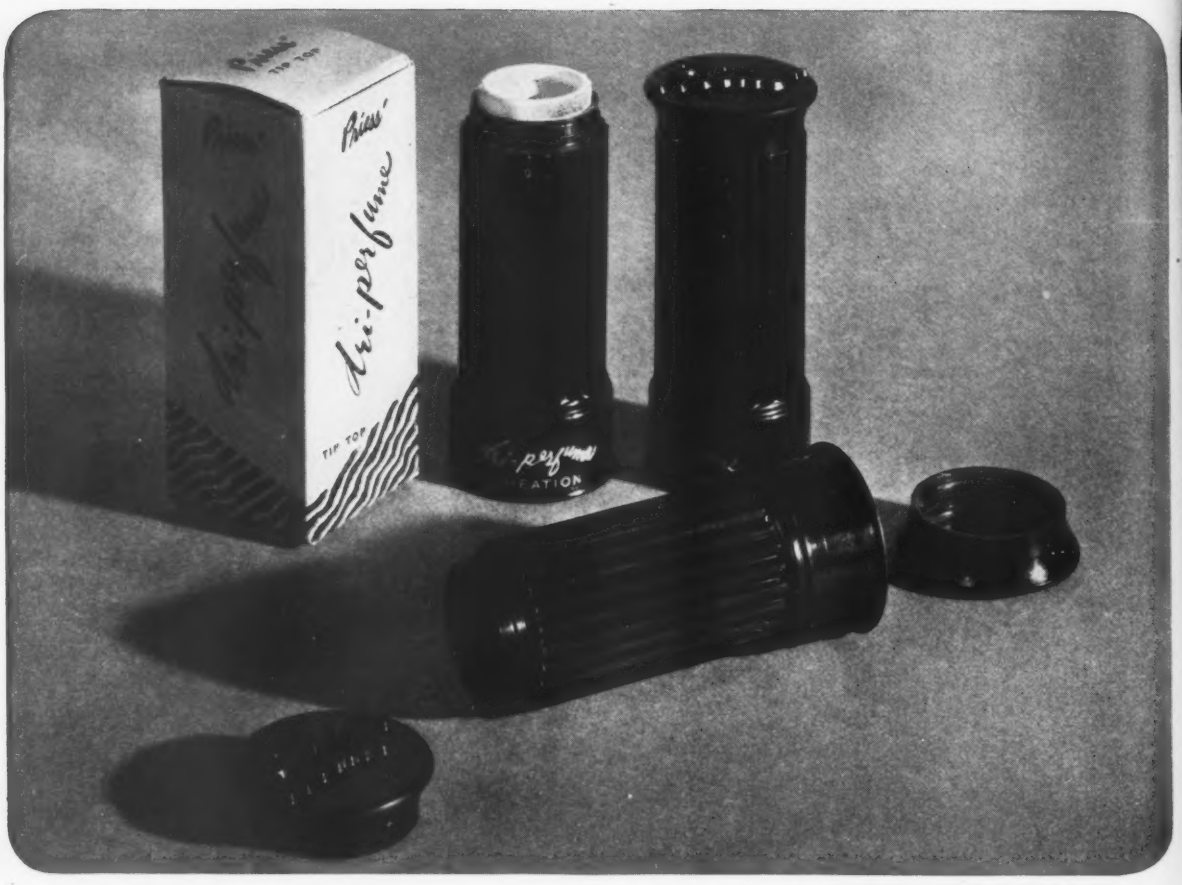
MODERN PACKAGING's 10,900 circulation is 100% ABC—100% paid. It is read for value and referred to for information by the keymen in the big companies. It has what it takes to register the advertiser's message!

MODERN PACKAGING

A BRESKIN PUBLICATION PUBLISHED BY MODERN PACKAGING CORP.
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LOOKING FOR THE PLASTIC THAT FITS YOUR JOB?

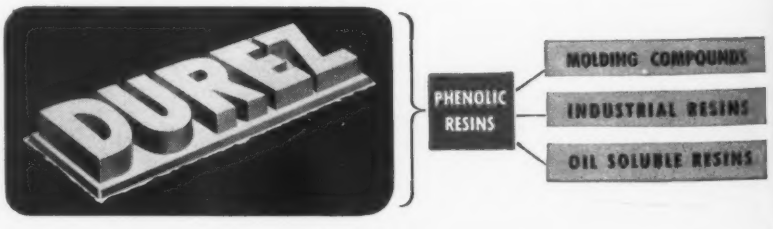
The unusual merchandising value of a plastic container has long since been proved. For this reason, probably no field has made more profitable use of plastics than packaging.

Of the many different types of plastic materials, the phenolics offer the widest range of inherent properties—accounting for their extensive use throughout this industry.

For example, Durez phenolic molding compounds are now being successfully utilized in numerous items ranging from the attractive "Dri-Perfume" container illustrated to bottle closures. In fact, more closures have been made from Durez than from any other plastic material.

A few important characteristics of Durez phenolic compounds are eye-appealing, non-bleeding finish, excellent moldability, impact strength, and resistance to heat, moisture, mild acids and alkalies.

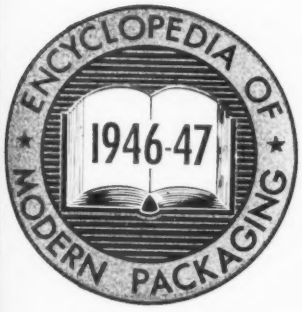
As specialists in the production of phenolic plastics for the past quarter century, Durez laboratory technicians are extremely well equipped to help you find the plastic that fits your job. Durez Plastics & Chemicals, Inc., 20[illegible] Walck Road, North Tonawanda, New York.



PLASTICS THAT FIT THE JOB


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DECORATIVE PACKAGING

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Decorative Films..... 501
Decorative Foils..... 503
Decorative Tissue Papers..... 505
Decorative Ribbons, Tapes and Ties..... 507
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Gift Wrapping and Packaging Services..... 510

Decorative Packaging
Page 495

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Principles of decorative packaging

Decorative packaging has been on a long leave of absence. The exigencies of war gave precedence to technical and utilitarian considerations, but fancy containers may now return. Since the removal of limitations on the various materials which make decorative packaging so effective, industry can use all that is available with a clear conscience. However, it may be some time before it will be possible to obtain all of the supplies that are wanted.

Meanwhile, the manufacturer doesn't need to put a stop to his thinking and planning. In fact, circumstances give him the best opportunity for a fresh start—a chance to utilize good taste and renewed imagination. It is evident that the designer will have at his disposal a wider choice than ever, due to the development of new materials such as the latest types of foil, metals of various kinds and recent innovations in transparent materials.

The transition was not without its compensations. Just as many a society beauty, whose only thoughts were of adornment and pleasure, discovered a field of useful service in war work, so decorative packaging materials and techniques were found to have real utility. For example, set-up boxes have always been regarded as the type of package which has been especially and almost exclusively suited to the packaging of de luxe products. (See *Set-up Paper Boxes*, p. 156 and *Special Set-up Box Types*, p. 168.) But the war pressed these packages into service for precision instruments, for blood plasma, for ammunition. The qualities which made for successful packages in the luxury field needed only slight modifications to render them capable of giving excellent utility service.

Conversely, it is to be expected, now that restrictions are removed and decorative packaging comes back into its own, that it has learned many useful lessons from its wartime experience. For instance, the structural features which have done an excellent protective job in packaging a delicate instrument for aerial navigation will be modified—and beautified—to protect and embellish a lovely piece of jewelry or an exquisite and rare perfume.

The objective of decorative packaging, of course, is to glorify a product and to enhance its appeal. For the most part, the decorative treatment may be seen at its best in connection with luxury products—cosmetics, confectionery, fancy bakery products, rare fruits, exotic flowers, jewelry and gift packages. Sometimes the results are atrocious artistically and wasteful from an economic point of view—which leads to the observation, in passing, that there are those who condemn all packaging as deceptive and misleading. Their position, carried to its logical conclusion, would require all packaging to be severely plain with no place for adornment, on the ground that a beautiful package exerts an undue influence on the buyer, who should buy on the basis of cold specifications.

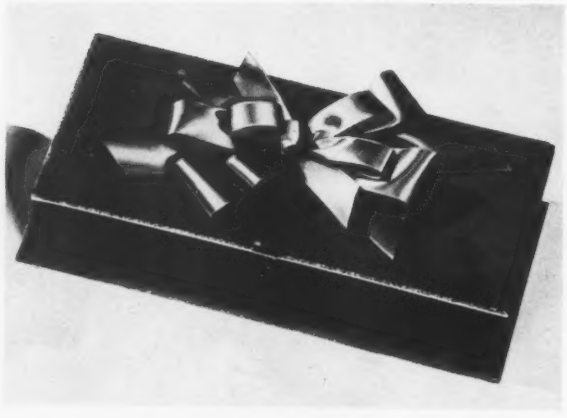
The truth is, of course, that though there are exceptional abuses, most decorative packaging is in harmony with the products packaged and in line with the desires of the consumer. Otherwise it could not exist. Time was when only the favored few could enjoy luxurious products, decoratively packaged. But mass production methods have spread these benefits and brought beauty to everyday life.

The materials of decorative packaging are many and varied. In fact, almost any packaging material can be treated decoratively. The fancy package may make use of several materials. The following list presents some, but by no means all, of the possible materials:

- Boxboard—coated; metalized
- Paper for box covering—embossed; imitation leather, fabric, or wood veneer; crepe; tissue; glazed
- Custom-designed box wraps
- Glass containers—hand blown or special molds
- Novelty closures of glass, ceramics, wood, metal or plastics
- Ceramic containers
- Wood bowls and boxes
- Metals—principally aluminum, copper, bronze
- Metal foils
- Ribbons, tapes and ties
- Fancy printed string
- Fabrics
- Plastics—molded, extruded or cast—of many kinds and colors with an infinite variety of possible shapes

1—Flock-surfaced box with gold paper edges, tied with ribbon, makes a handsome decorative package.

PHOTO, COURTESY F. J. SCHLEICHER PAPER CO.



Coatings—for both protective and decorative effects
Transparent plastic sheeting

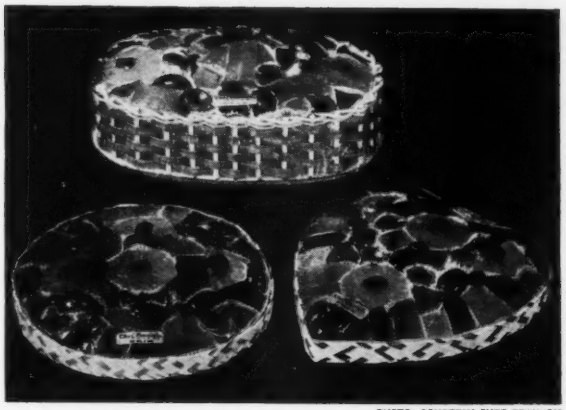
Various marking methods and graphic arts processes are also at the service of the decorative package, with all of their many possibilities in color printing. These materials and processes are discussed at more length elsewhere in this book. The purpose of the foregoing list is merely to present a quick review, to suggest the wide scope open to the decorative packager.

Perhaps the first and most important principle to be observed in decorative packaging is this: the package must be appropriate for the product and its market. Here—as is almost invariably the case in planning any kind of package—the problem should be approached from the standpoint of the ultimate consumer. The experienced merchandiser knows full well that class lines are pretty sharply drawn when it comes to consumer acceptance. For instance, a lurid label and a flamboyant package will make a sure-fire hit with certain levels of society in the promotion of such products as wines and liquors; whereas severe simplicity and dignity of line and design must be adopted to appeal to other levels. It is worth noting that, as a general thing, the aforesaid lurid labels and flamboyant packages are usually found on the cheap and unknown brands, while restraint and dignity usually characterize the well-established lines. Hence the starting point should be a pretty clear-cut idea of one's potential customers.

This includes, of course, a knowledge of the outlets through which the products are distributed. It will not do to answer this question, for instance, by merely saying "Department stores," but one must know just exactly what kind of department stores.

The principle of appropriateness covers the element of cost as well. There is, of course, no standardized percentage for package cost in any line of business, let alone the fields where decorative packaging belongs. It might be concluded that since the decoratively packaged product represents only an occasional purchase, it therefore is possible to "get away with murder" by expecting an elaborate package to make up for product deficiencies. Indeed, that is one of the gripes of the consumer agitator against all packaging. It doesn't take more than a moment's thought to convince anyone that that is a short-sighted policy; that it is more profitable in the long run to keep package cost within due bounds.

The firm that goes in for decorative packaging of its products usually finds itself committed to a policy of frequent package changes. This has both its good and bad points. Among the advantages is that if one does "pull a boner" it's not irrevocable; it can be remedied quickly. On the positive side, however, it means constant freshness and variety—something which the American public loves, particularly in connection with luxury items and occasional purchases. To take fullest advantage of this public preference means that package development must become a major executive responsibility under the direction of a supervisor who can make sure that all angles are considered before a package is adopted.



PHOTO, COURTESY CHEZ FRANÇOIS

2—The decorative quality of the product is used as part of decorative motif for glazed fruit packages.

A point to be noted is that decorative packaging, because of its use of so many kinds of material, very frequently entails the need for hand or semi-automatic packaging operations, particularly if changes are made periodically. These operations of course are more costly per unit of product than fully mechanized production is, but that is a condition which the packager must face in deciding whether results warrant expense.

Above all, the cardinal rule is to follow the dictates of good taste. Adherence to that principle will probably solve many problems of economics as well as protection and appeal. The ancient Greeks had a saying: "We Athenians love art with cheapness." Their work still stacks up pretty well.

3—Designed to appeal to the mother is the decorative effect on this open-face carton for baby bibs.

PHOTO, COURTESY LEE ANN SALES CO.



Fancy papers for box use

The year will be marked by tremendous new interest in decorative papers, particularly in the use of foils and metallics, which are off critical lists for the first time since the war.

Limitations, however, will be imposed by the quantities of supplies available. Decorative paper manufacturers say that they will be able to supply only about 50 per cent of the 1946 demand and that it is likely to be well into 1947 before users can obtain enough stock.

This continued shortage of paper makes it difficult, too, to predict definite design trends, since most fancy papermakers, until this situation eases, are continuing to make only standard lines suitable for year-round packaging purposes. In normal times, success or failure of a line of packaged products or a complete line of fancy papers depends upon how well the manufacturer of boxed merchandise, the boxmaker and the fancy paper converter have been able to forecast popular taste in design and colors.

Decorative paper manufacturers, like those in other industries, are more alert to methods of measuring consumer preferences in regard to design. Much of their past planning has been in the dark, they say, because of their remoteness from the end usage of their products. The converter sells to the boxmakers. Oftentimes he does not know on what type of box the boxmaker plans to use the paper. Closer cooperation with boxmakers and users of the boxes will produce designs more quickly styled to changing tastes and fancy papermakers hope for closer cooperation in such planning.

There is an excellent opportunity for the designer at this time to develop completely original designs integral to paper and paper processing in contrast to past practice. Established embossing designs, for example, are most often simulations of fabrics such as linen, herring-bone tweeds, silk brocade, laces, basket weaves —or leathers, such as pin seal, alligator or ostrich. Oftentimes, printed designs are wood grain reproductions or florals patterned after cretonnes. Such designs are often actual reproductions of fabrics. Paper men constantly cover the textile markets to find new fabrics for such reproduction in keeping with fashion trends. Many of these are beautiful designs and will continue forever. One paper man can point to an embossed leather pattern that his company has been producing for more than 70 years. Off and on it returns to popular demand. Throughout swatch catalogs one might find hundreds of designs that are good year in and year out.

Nevertheless, there is constantly a desire for something new. The fancy paper industry points to the modernistic or geometric design influence that characterized the late 1920's and the early 1930's. They are trying to forecast what the next will be. To date, nothing so pronounced has replaced this vogue. There does seem to be a preference, however, for more dramatic design—floral prints, for example, on a larger scale, backgrounds of solid color with brilliant overprints. All colors will be keyed to couturier colors and high-fashion color trends.

One paper company has revealed a paper design based on forms portraying light refractions through glass and another symbolizing the graph lines translated from electronic impulses of radar waves. These designs have a timely theme, but how they will be received by the buying public this company does not know. It is willing to take a gamble, when the patterns are worked out to its own satisfaction.

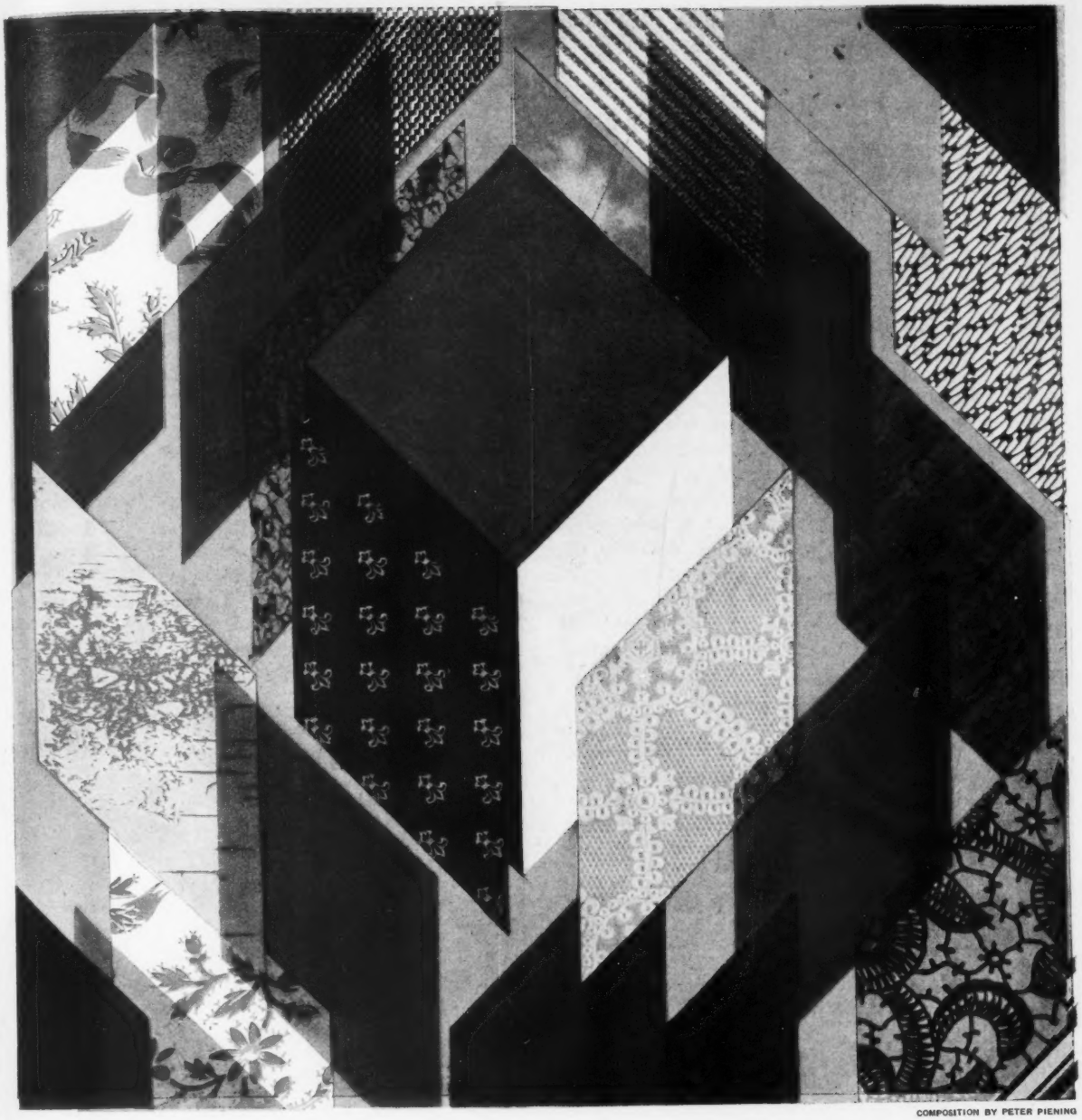
Some of the fancy paper companies have made excellent protective papers with greaseproof and water-vaporproof qualities for ordnance wraps and other overseas shipments. Many of these offer the user a completely new type of packaging paper. Some of these may be combined with decorative printed or embossed effects to provide eye appeal and the designer has an excellent chance to adapt some of these developments for civilian uses.

Leading consumers of fancy box papers are stationery, candy, cosmetic and jewelry manufacturers and distributors. Another big field is gift boxing of all kinds. Of all these, the manufacturers of boxed station ery and papeteries are said to be outstanding in the determination of style trends. Tons of papers are used for this purpose every year as box coverings and box linings. The designs selected are watched avidly by the fancy paper- and boxmaking industries because of the influence on boxes for other lines of merchandise.

Competitive merchandising is placing increased emphasis on the value of trade-mark and brand identity. Many companies have their own trade-marked papers. Fancy paper manufacturers believe there will be more of these in the future. The prospective users, however, should know that trade-marked papers are feasible only for the packer who can use upwards of 1000 reams (approximately 26,000 lb. of average weight box paper) before the cost of art work, engraving and other specialized production costs are covered.

Most makers of fancy paper have printing facilities and embossing rollers for producing several hundred different designs. In normal times, they introduce 8 to 12 new printed patterns in various colors and 4 or 5 new embossing patterns a year. Old designs are kept, many revived again and again at five to ten year intervals; others are inactive unless a particular order is requested.

Once the paper situation clears, all of these designs and many new ones will be ready for resumption of the decorative packaging that is such an important aid



COMPOSITION BY PETER PIENING

Many fancy papers, some with new protective qualities, will be available. In this abstract conception, based upon actual swatches from various manufacturers, the artist represents the ever-widening range of choice.

to modern merchandising. Any of the fancy paper stocks and methods of producing them listed below are possible, but the user should select them with care—his choice based on measurements of consumer preferences, the character of his market, the quantity he requires, the cost factors, etc.

In the *Pictorial Review of Set-up Boxes* on p. 161, numerous fancy paper applications are illustrated, some representing novel designs, others showing the use of standard, time-tested patterns.

The following list includes practically all standard stocks used for fancy box coverings.

Uncoated box papers—The kind of paper, such as rag, sulfite, kraft, or groundwood, which is to be coated, embossed, etc. This may be antique, natural finish, or super-calendered.

Coated box papers—Prepared by several processes, as follows:

1. Matte coated: A casein- or clay-coated paper made on brush coater or roll coater, or some type of brushless coating machine.
2. Brush finished: A coated paper whose surface is polished by brushes.

3. Plate: A coated paper, finished smooth by cold rolls through pressure in a stack calendering machine. For a very high finish this paper is sometimes subjected to steam before being calendered.
4. Friction glazed: A coated paper whose surface is polished by heated rolls in a friction calender, friction being produced by the faster rotary action of the steel polishing roll against the slower cotton roll.
5. Mica: Paper whose coating material consists of ground mica crystals to give it a sparkling, finished appearance.
6. Flint: A coated paper whose surface is highly polished by being rubbed across the sheet with flint stones. This process is slow but effective.
7. Waterproof: A paper coated and then top-surfaced with waterproof material, such as casein or gums; or coated once with heavily sized color; or mixed with waterproofing gums.
8. Waterproof lacquers: Coated papers using pigmented pyroxylin lacquers, which produce an unmottled surface with antique or high-gloss finish.
9. Flock: Papers coated with varnish on the surface of which is shaken or blown finely powdered cotton, wool, rayon or silk; commonly known as *velours*.

Real and simulated metallic effects on all coated papers are produced as follows:

Gold, platinum, tints—Produced by grinding bronze (gold), aluminum (silver) and copper, with casein and other gums or with pyroxylin lacquer; paper generally stack calendered to appear smooth and brilliant.

Silver, glazed (silver coated)—Paper coated with "argentine," a precipitate of tin, which is first dull gray in color, but is polished to a silver finish by a friction calender. "Argentine" finish is now also available in gold and colors, both plain and embossed.

Pyroxylin coated—These are lacquered in bright, dull and pearly irridescent effects.

Half fine metallics—Produced by laying patches of a thin copper or aluminum alloy approximately five in. sq. on paper that has been coated with an adhesive. The patches are allowed to overlap in order to form a continuous metallic surface and the overlapping edges are brushed to remove any surplus.

Foils—Produced by applying to paper a continuous sheet of metallic foil, usually tin, aluminum, zinc, or their alloys. The foil is bonded to the paper by some form of adhesive.

Fancy box-covering papers are either embossed and tipped with colored or metallic ink, or printed in designs of one or more colors. They may be decorated in mottled, speckled, streaked or blended effects, or in a definite design by any of several processes, such as wallpaper or other rotary printing machines, intaglio printing, print or ink embossing or topping.

Kidder—Oil-ink surface printing from curved plates locked on a roller form and registering each impression as the paper runs beneath.

Wallpaper—Water-color surface printing in one or more colors from relief-pattern rollers, one for each color, registered to make the complete design.

Aniline—Stained or printed or both, with rubber rollers and relief-cut patterns—generally with alcohol-gum colors.

Intaglio or rologravure—Papers printed from a pattern engraved on a copper roller by the photogravure process or by the use of a pattern mill. The ink, which may be water color, aniline, oil or lacquer, is wiped off the roller by a thin blade set across it which controls the amount of ink by the angle of the blade and the depth of the engraving.

An embossed paper is understood to be any type having a pattern in relief, produced by any of the following processes:

Regular—A steel pattern roller and a wet paper-matrix roller are mated together.

Friction embossed—The pattern is pressed against a smooth paper roller run without gears, which permits a slight friction as it makes contact with the pattern. Friction is produced by the use of cold and hot pattern rollers, the latter being bored and piped for steam heating. The combination of pressure and friction causes a deepening of color in the area of the pattern.

Print embossed—Embossing and printing in one operation by the application of ink to the embossing pattern.

Topped and embossed—A two-toned decoration made by applying color through a roller to the surface of the embossing.

Spanished—Color applied to the entire surface of a sheet and then scraped off with a blade, which leaves varied tones of the decorating color depending on the varied depth of the embossed surface.

Common—Patterns in common use by manufacturers of embossed paper. For instance: Skytogen and certain leather-grains, moire, basket weave, Persian lamb and swirl designs.

Exclusive—There are several hundred different embossing designs which have been originated or purchased by individual manufacturers who thereby own these designs exclusively. Most manufacturers have exclusive designs of their own and many such designs are protected by registration at the United States Patent Office. The Coated and Processed Paper Association, 1002 Union Trust Bldg., Providence 3, R. I., maintains a registration bureau of these designs for the protection of its members and to answer inquiries from customers and users.

The following descriptive terms are commonly connected with box papers, their sales value, or qualities:

Fabric designs—Papers printed in designs that imitate various fabrics, commonly known as "fabric prints"; or embossed in imitation of fabrics, such as rep, linen, burlap and others.

Leather-grain—Papers with designs like grains in leather produced by embossing, ink embossing, spanishing, printing or coating. Common examples are alligator, seal, walrus, caracul, etc.

Decorative films

by J. M. Cowan

All transparent films achieve a great decorative effect by reason of their sparkling, eye catching qualities. In this article will be discussed the imaginative, unusual film applications and ideas which attain outstanding results, rather than the properties of the films themselves or special processing methods. The latter are used to create embossed effects and colored films. However, the volume of their sales is relatively small, notwithstanding holiday packaging, for even when used for gift wrapping they are often printed or fabricated into ribbons or holiday bands or other forms for greater appeal and utility. By comparison, transparent papers have greater popularity when they are printed or otherwise processed to announce to the recipient: "It's a gift."

There is a distinction to be made between standard merchandise glamorized by transparent wrapping for present-giving during a particular period, and items such as candy, cosmetics and flowers, which have perennial appeal for gift buying. Each of these categories presents a different packaging problem.

Decorative cellophane applications

The most widely available transparent film is cellophane film. It is also the least expensive and is probably converted and fabricated in more different forms by processors than any other. Future film developments may change this picture, but most authorities agree that cellophane film will continue to command a substantial part of the decorative packaging market.

Cellophane film may be printed by aniline, letterpress or gravure processes. Printing may be applied either on the surface or on the under side of the sheet. In the latter case, the design is viewed through the film. This technique imparts high luster to the area which is printed.

Drinking straws made of cellophane offer marked decorative possibilities. The material may be flocked or pleated or laminated for certain uses, although cellulose acetate is generally preferred because of its dimensional stability.

Cellophane is made up in bags and envelopes, printed or plain, and may be shredded for nesting choice fruits or fragile pottery gift units in larger containers.

Ribbons of cellophane vary from 1/4-in. to 3-in. widths and cover a wide range of colors and designs. Some incorporate aluminum foil as an edging material or have a foil inserted between the folds for purposes of greater luster and brilliance.

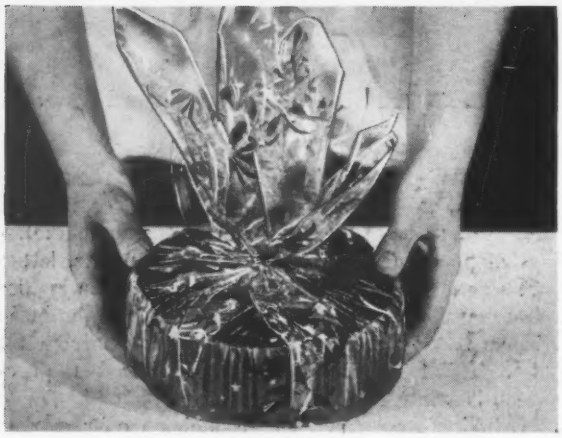
Gift wrapping value

To the manufacturer, wishing to stimulate gift buying by some package change, many approaches are open. If now using printed film, he can have a holiday

PHOTOS 1 AND 2, COURTESY THE DOBECKMUN CO.



1—The value of decorative film packaging has given impetus to the use of printed transparent films for products of all kinds. Hosiery and lingerie manufacturers have been quick to realize that delicate fabrics appear to great advantage in these packages, with printed effects and color contrasts enhancing their feminine sales appeal.



2—The crisp, sparkling cellophane is gaily tied to effect a fresh-looking transparent wrapping.



PHOTO, COURTESY STEPHEN LEEMAN PRODUCTS

3—Cellophane is frequently used as an outer wrap to protect container, label and ties, as shown here.

design feature incorporated in his standard wrapper or bag for a limited period, or may buy a stock band or wrapper which is applied right over the standard package. He may apply an attractively tied ribbon in the same manner. In these cases, any stock which is not sold during the holiday season is readily reconverted by removing the holiday band or wrap.

Multiple and combination packaging

The manufacturer may create family sets made up of an assortment of his products which may then be overwrapped in printed film to show the contents of the assortment while suggesting a gift purchase by the design of the wrapper.

Limited price chains and some department stores have been outstandingly successful in intelligent packaging of related items. In many cases, a re-use container is used to hold the items, the combination then being attractively gift wrapped. Multiple packaging of a dozen or more like items is equally effective. Common examples are chewing gum, razor blades, cigarettes, candies and sundry related merchandise.

The larger manufacturer or store may, of course, have a printed wrapper or bag designed for its own exclusive use.

4—An interesting and unusual treatment of transparent film is achieved by imprinting lace design.

PHOTO, COURTESY MILPRINT, INC.



Decoration and utility in opening tape

Another decorative touch which contributes to the consumer's convenience is opening tape applied to tight-wrapped cartons. Colors of the tape may contrast with the color scheme of the package or may harmonize with it, or the tape may be printed with slogans or instructions.

Color appeal

On a cellophane bagged line of candy, one producer stepped up display value smartly by flaring the tops of the bags which were then banded with mixed colors of pressure-sensitive tape. In another case, the major color in the design printed on transparent bags was broken up into equal quantities of red, green, blue and yellow. In packing the bags, the manufacturer mixed up the colors so each was equally shown in each dozen.

Cellulose acetate films laminated to paper or board contribute high luster, soilproofness and durability. The paper may be laminated after printing by means of a fully transparent adhesive. In other applications, opaque color is added to the adhesive, producing a very rich, colorful effect. The film may then be printed for identification purposes, or labels may be attached.

A third process involves printing the acetate before laminating. In this instance, the adhesive may be transparent, thus showing the paper color behind the design, or it may be colored to add any desired background color to the design.

In making domed cosmetic containers, a thicker acetate, three mils or over, is generally laminated to the printed paper. This gives rigidity to the finished container, as well as long-lasting brilliance and simulates the appearance of a molded plastic container.

Decorative foils

by C. F. Manning

Metal foil as a decorative material had its beginning many centuries ago when the Chinese hammered gold and silver into thin sheets by hand. Since those days, vast improvements in production and manufacture have been made, new metals and processes employed which offer to package-minded executives of today a limitless number of decorative effects.

Aluminum foil is more widely used commercially than other metals because it is economical, can be rolled to thinnest gauges, printed in color, embossed and mounted to almost any type of stock.

For candy wraps, foil mounted with glue and wax to lightweight tissue bond or glassine is preferred. For candy box wrapping, the most satisfactory stock is foil, solid-glue-mounted to sulfite papers. Tight and loose wraps are made up of thin foil, solid-glue-mounted to lightweight bonds.

In addition to the above specifications used in industries that do volume business, other stocks are made up to take care of specific requirements. Plain foils, less expensive than decorated ones, are used where there is no particular advantage in decoration—containers for tea, chewing gum, cigarettes, and some types of candies.

Decorative foils are easily mounted to boards for the production of cartons, boxes and displays. They have been used with outstanding success for such items as cosmetics, gift boxes, greeting cards, fancy candy boxes, labels, counter displays, Christmas wrappings, window displays, seals, dials, etc. Florists use large quantities for decorating potted plants, as liners for boxes, and for corsages. One interesting development is the possible use of foil coated with various films for



PHOTOS 1, 3 AND 5, COURTESY ALUMINUM CO. OF AMERICA

1—When a few of the cookies are individually wrapped in metal foil, their brightness and unusual forms catch the eye of the consumer, and these gay notes make the entire assortment look even more tempting.

PHOTOS 2, 4 AND 6, COURTESY REYNOLDS METALS CO.



2—Protection plus attractive appearance is achieved in these examples of cheese wrapped in printed metal foil.



3—An opportunity for brand identification, as well as protection, is afforded by foil on bottle necks.



4—Many of the popular brands of candy are wrapped in plain, embossed and color-printed aluminum foil.



5—Even such food staples as bread may have their packaging enhanced by the brightness of metal foil; designers have predicted wider use of foil for foods.



6—Metal foil ranks high on the list of materials for gift items—it makes the package look "special."

making draperies, ladies' shoes, bags, millinery, etc.

Foil in its various forms may be printed in color by any of the standard processes—letterpress, lithography or gravure, with the latter method favored where large volume is a factor.

Because foil lends itself perfectly to printing, lacquering and embossing, it presents to the designer limitless opportunities for new and sensational effects.

In the printing process, transparent inks may be used in combination with opaque inks. Where transparent inks are used, light penetrates the color, hits the metal foil and is reflected back through the color. This produces brilliance and high luster, but if only transparent colors are used, legibility may suffer where brand name or other important copy should be featured. By combining opaque with transparent inks, the brilliant reflection of light can be controlled and used where it is needed to produce the best effect. Any competent commercial artist can combine them effectively.

Being lightproof, metal foil guards products containing oils or fats against the action of rancidity which is accelerated by light. It is an excellent insulating material, possessing power to reflect 95 per cent of all radiated heat. Metal foil is also moistureproof and provides protection against foreign odors so harmful to confections and many other products. (See *Metal Foils, Technical Aspects*, p. 644.)

There are some uses of foil which are not strictly decorative, though they have strong "leanings" in that direction. One example is the use of the lustrous metal for secondary closures or bottle caps as an added precaution against tampering. These caps are easily and quickly applied; just as easily removed, but their absence from an accustomed place is warning to the purchaser. The package buyers have been quick to apply decorative principles to this material, which is used in the case of bottle caps primarily for protection.

Decorative tissue papers

by G. H. Krueger

The idea of decorative tissues originated in the Old World. During the seventeenth and early eighteenth centuries in Western Europe, hand boxes for traveling were used by ladies of fashion. These hand boxes were covered with paper similar to wallpaper, mostly of floral design patterns. Late in the eighteenth century, shopkeepers made use of thin straw-colored paper for twisting into conical shapes. It was the beginning of paper bags, for they held such useful items as sugar, flour and the run of household necessities. In the latter part of the nineteenth century, postal rates were very high in Germany and the Scandinavian countries. The paper commonly used for envelopes was very heavy, and these envelopes cost a lot of postage in their own right. Therefore, as an economy, lightweight papers were used for envelopes, and to make them opaque, so that the contents of the letter were confidential, envelope linings of light colored tissue paper came into general use.

It is interesting to note that in this country the linings were used chiefly for their decorative quality, because our envelope manufacturers had, from the beginning, been concerned with the manufacture of opaque paper for envelope purposes. By 1917, stationery manufacturers in this country generally used fancy lined envelopes, and the vogue spread like wildfire. Through the 1920's the demand for envelope linings was very large although the cost of printing and design was high, and the work was crude in comparison to what it is today. So-called modernistic designs were largely used for envelope linings, and a lot of geometrical patterns were produced, mainly through the medium of drawing board and instruments.

With the 1930 crisis, linings started to be out of date, principally because the envelope manufacturers were forced to lower prices during the depression period. Today envelope linings have virtually disappeared, but decorative tissue has a much broader market as a wrapping and packaging gift material.

Well-wrapped and attractive packages have tremendous appeal. It is fun for the person who gives the present to wrap it attractively, for it brings out his own creative genius and artistic ability. It is also a distinct pleasure for the recipient, because even a moderately priced gift, wrapped attractively, makes a fine impression.

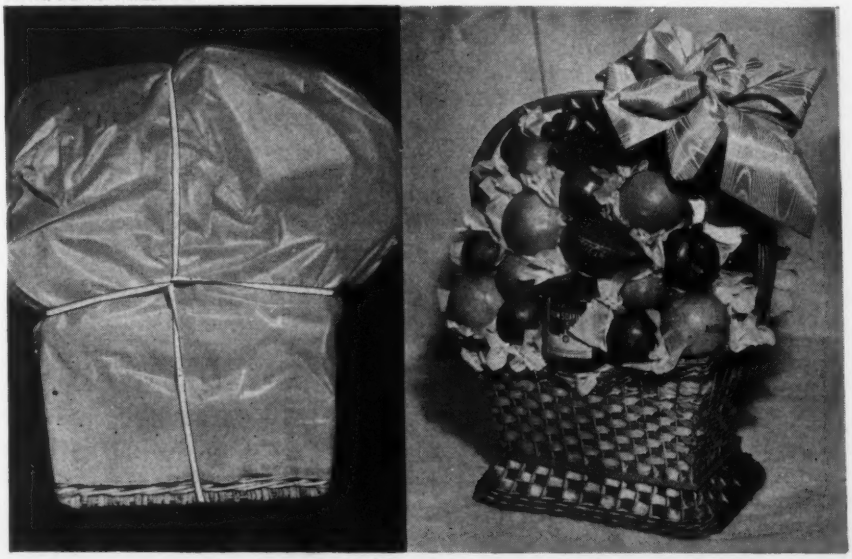
Consequently, the packaging or gift wrapping fields attracted some of our best designers and artists. It is they who deserve much of the credit for the popularity of decorative tissues.

Likewise, the equipment people became interested, and developed superior printing and other equipment, so that the method of printing and drying produced a well-printed sheet of lightweight paper. The ink manufacturers cooperated, with the result that the brilliant tone effects of various printing inks were improved. As a result, real quality color printing on tissue paper is now possible.

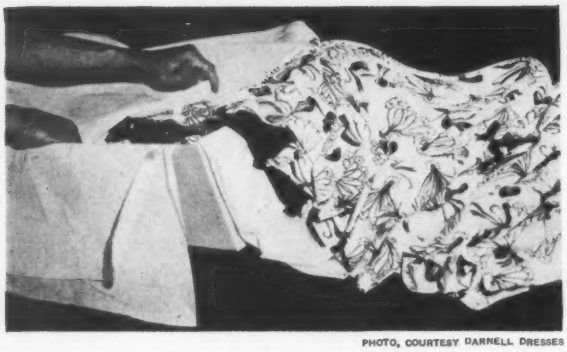
Tissue paper is defined as a paper that is 20 lb. or less in basic weight, 24 by 36—500. This means that a ream of paper containing 500 sheets, each sheet 24 by 36, weighs less than 20 pounds. Plain tissues are usually 10 lb. and the weights used for printing are usually 18 or 20 pounds.

Plain tissue papers used for commercial packaging and wrapping are furnished in sizes 20 by 30 for No. 1

PHOTOS, COURTESY CHARLES & CO.

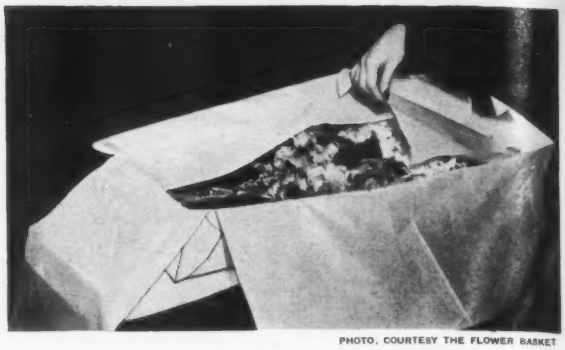


1—The delightful gift presentations illustrated here display the versatility of tissue paper for both inner and outer wrappings. A heavier type of paper encloses the fruit basket for delivery purposes; when this is removed, the fruit is revealed with each piece individually wrapped and well protected.



PHOTO, COURTESY DARNELL DRESSES

2—Plain tissue paper is the traditional favorite for the protective wrapping of delicate fabrics.



PHOTO, COURTESY THE FLOWER BASKET

3—Fragrant fresh flowers, too, are effectively presented when their delicacy is protected by tissue.

white, weighing 7 lb. per ream, and 24 by 36 in. No. 2 white and manila, weighing 10 lb. per ream. The main function of No. 2 white and manila is that of giving protection rather than refinement and beauty to the contents and to the package. They are utilitarian tissues for the protection of china, glassware and other fragile merchandise.

A sulfur-free tissue, commonly called jewelers' or silver tissue, is used to guard against product discoloration due to contact with the air or unclean tissue. It is used to wrap such articles as those made of gold, silver, copper, brass, etc. There are two kinds—white and kraft. White antitarnish or silver tissue is a specially treated No. 1 grade. It contains a higher grade pulp and must be handled more carefully all through the manufacturing process than regular No. 1 white tissue. Most kraft tissue will pass this nonsulfur test, too, because the processing of kraft pulp differs from that of sulfite pulp which is used in the manufacture of white tissues. Kraft tissue, however, has the same color as ordinary kraft wrapping paper. Hence, hardware items and machinery parts use this, while white is used on the higher quality gift-type items, where appearance is a factor.

Fruit wrappers are made of tissue, usually from 12- to 18-lb. stock. The wrapping protects and beautifies the product, and the customer feels that he is buying fruit that is well and properly packed. To the citrus fruit wrappers and apple wrappers a little oil is sometimes added, so that the fruit arrives in perfect condition.

Special printed wrappers are commonly used, which serve to identify brands.

Florist tissue is the 12-lb. sheet M. G. of No. 1 white tissue which is used by retail florists in flower cartons to protect the delicate blooms, as well as to frame the flowers and to give them an additional feminine touch. Waxed green tissue finds an outlet here also, where it is frequently used as an inner wrapping liner for bouquets and potted plants.

The tissue used for the purpose of wrapping bottles, wine, whisky, etc., is of kraft base, for the reason that good twisting qualities are required. This tissue is generally imprinted with some special design or advertising copy and occasionally a special watermarked tissue is used as a base stock. It gives protection, adds eye appeal and keeps the merchandise clean and free from lint during shipment.

It must be mentioned, too, that both plain and waxed tissue cut into fine even shreds find an important use as soft, clean and highly resilient packing materials. For instance, in the packing of china and glassware, shredded tissue has taken and maintained its place alongside of cellulose wadding. Its protective qualities are good, and its cost nominal. Colored waxed tissues are frequently used for packing candy, such as purple and green for Easter sweets.

As printing methods constantly improve, new and more attractive types of paper are being produced. Year after year we find its use spreading. Packaging has been on the march for some time. Designers and manufacturers are looking into the future; they are keeping their ears attuned to the times and cannot overlook the effective uses to which tissue can be put in creating eye-appealing packages.

4—Examples of decorative tissues, water-color printed, with "choke roll" or solid background designs.

PHOTO, COURTESY TUTTLE PRESS CO.



Decorative ribbons, tapes and ties

by N. J. Strauss

There are three principal markets for the sale of decorative ribbons, tapes and ties. Stores of all types purchase these materials for their own packaging; department stores use them for their gift wrapping services—of which they are becoming increasingly conscious—and consumers buy their own materials to achieve personalized, beautiful gift packages. Both the industrial and consumer demands have shown a marked up-swing, so that they exceed the present slight increase in supply. The consumer Christmas market for this merchandise is of large proportions and there will probably be a better supply this year than there was last year.

Decorative tying materials, in general, can be classified into three broad categories: ribbons made of cotton, of cellophane and of rayon or rayon and tinsel.

The weftless type of cotton ribbon is made by passing the cotton yarns through a binder material so as to form a flat, smooth, uniform tape. This tape or ribbon may be had in either solid or a combination of colors and it frequently is passed through a crimper to add a decorative effect. The tape itself may be obtained imprinted with names or decorative patterns. This cotton ribbon is made in widths from $^{3}/_{16}$ in. up to 1 in., packed either in bulk spools for commercial or industrial use, or in small units for home use. It has enjoyed wide popularity for a great many years. Due to the shortage of cotton yarns not much of this ribbon is available. However, it is anticipated that the quantity will steadily increase.

Cellophane ribbons are generally printed or decorated and folded to add a strong tying edge. Having all of the brilliant sparkle and luster that is embodied in cellophane, they add an unusual decorative quality to the package. Cellophane ribbons may also be laminated in combination with tinsel and with cotton or rayon threads. They, too, are packed in bulk spools and sold through various jobbing outfits to manufacturers and retailers throughout the country. They are also put up in small consumer rolls, bolts and spools for home use. These ribbons are generally made in a variety of seasonal colors. Since limitation orders have been removed, it is possible to obtain cellophane ribbons, although not in abundance. The supply of cellophane ribbons is improving and it is expected that they will be in generous supply by Christmas of 1946.

Fabric ribbons generally are made of rayon or rayon and tinsel. Perhaps the oldest decorative ribbons, they have been used since time immemorial for decorating gift packages. Made on narrow ribbon looms, the variety of designs and combinations is inexhaustible.

A form of fabric ribbon that has enjoyed tremendous popularity in recent years is the slit-fused or cut ribbon which can be made in great quantity in widths of $^{1}/_{4}$ in. and greater. It is made by cutting 36- to 54-in. wide acetate rayon at temperatures from 800–1500 deg. F., thus melting the edges which then re-harden to form their own selvage. Slit-fused or cut ribbon has the advantages of being completely uniform in width and comparatively inexpensive. Various forms of imprinting and other decorations may be applied.

All fabric ribbons, whether woven on narrow looms or slit and fused from wide fabrics, are extremely strong and easy to tie. Frequently, these ribbons may be re-used a second or third time.

At present, there are definite trends in design, fabrics and color although, in the main, traditional usage of decorative ties is being maintained. In the field of design, some new ribbons are being made in checks and polka dot effects. A definite effort is being made by manufacturers to coordinate their ribbon products with the latest ideas in decorative paper. This same principle is applied to color. Although the colors for holiday wrappings, particularly for the Christmas trade, are fairly well established, there has been a definite movement toward modern styling in color as well as design. For example, one manufacturer has experimented with such shades as wine, brown and black for high style use, and found good customer acceptance.

There is an increased interest in using cut velvets and flocked material for decorative tying. Metallic finishes will be more in evidence now that lahm and tinsel are available again. Sheer fabrics, such as net, marquisette and ninon have been found to be very good as tying materials. However, when heavier fabrics, particularly the time-proved red satin for Christmas, are obtainable again in substantial quantities, there is a question as to whether or not the sheer fabrics will retain their popularity.

Dressed with pastel colored ribbons and hand-painted flowers, a mirror candy box is a delightful gift.

PHOTO, COURTESY LOFT CANDY CORP.



Re-use and novelty boxes

The decorative box is back after a long holiday. With the advent of war, re-use and novelty containers were virtually abandoned, with the exception of a very few substitute items. Now that materials for their production are gradually becoming available again, the high style and utility advantages of these containers promises an increase in their popularity.

Leatherette boxes and containers

For years, genuine leather was considered the finest covering for display boxes of all kinds, and rightly so. But leather is expensive, and in its place came leatherette. This versatile material is made to simulate any kind of genuine leather, and the better grades are practically indistinguishable from the real article. Leatherette fabrication has been developed so that it has the great versatility of simulating effectively such varied fabrics as linen and burlap.

Leatherettes consist essentially of a base of cloth or long-fibred paper with a strong flexible pyroxylin coating. They have good tensile strength and a surface that wears well, are not easily soiled or scuffed and are simple to clean with a damp cloth. They can be made in unlimited colors, beautiful pastel shades as well as the shades more typical of leather. Their attractiveness may be increased with a panel, a crest or decorative borders on the lid and sides of the box. These designs are applied to the material before fabrication by stamping or embossing or a combination of both processes.

Paper-base leatherettes are used more extensively than those with cloth bases, because they are easier to handle, yet have equivalent wearing qualities on the surface and more than enough tensile strength for the requirements of most boxes or other containers. But appearance and price are not the only reasons for the increasing use of leatherette.

The entire process of fabricating leatherette boxes and containers is extremely flexible. It is done mostly by hand and involves machine operations to only a limited extent, which lends itself to small production runs up to 100,000 and more. Leatherette may be applied to metal, wood, plastics and cardboard with the same ease as leather. Since it is pliable, it can be manipulated at odd angles, around corners and into difficult conformations of any kind, and its cloth background makes an excellent foundation for all types of adhesive and glue.

Decorative wooden boxes

Decorative wooden boxes have found a prominent place in the field of packaging. Such containers have a number of features to recommend them: lasting beauty, ruggedness and permanent re-use value, along with an almost limitless selection of finishes.

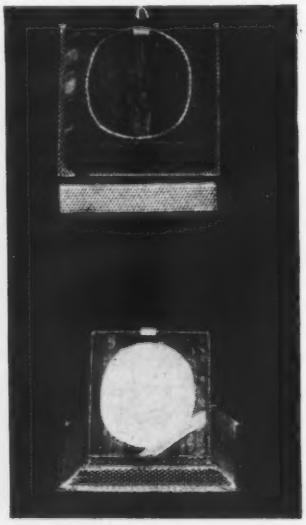
All wooden merchandising boxes are made either of solid lumber, of veneers or of the two combined. A number of cabinet hardwoods may be used, but gumwood is most generally selected because it is easy to finish and lends itself readily to the application of a wide variety of finishes. It is likewise relatively plentiful and inexpensive. Cedar is also widely used because it has natural beauty, is easy to finish and, in addition, gives off a pleasing odor believed to keep moths away.

It is possible to make packages from inexpensive wood and have grains of carefully selected rare woods applied to the surface. These expensive-looking finishes are exact reproductions of a wide variety of richly grained woods that ordinarily are too costly to use in

PHOTO, COURTESY PETERSON BROS.



PHOTO, COURTESY UNIVERSAL JEWELRY CASE CO.



1—(Left) The handsome wood finish on this silverware chest makes it a prized possession for the home. 2—(Right) Luxuriously lined jewelry cases enhance the loveliest present.



PHOTO, COURTESY EUREKA MFG. CO.

3—The fabric used for lining this silverware chest is treated to resist tarnishing action on contents.

containers which carry popular-priced merchandise.

The boxes may be lined with various materials to enhance their beauty. The interiors may be left unfinished, but with various linings—from inexpensive papers through all the list of duvetyns, satins and velvets in various combinations—it is possible to create almost any desired inside effect.

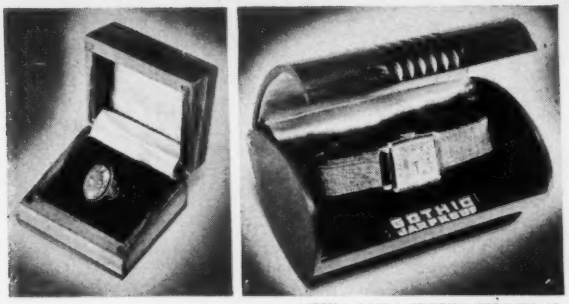
Fancy wooden boxes are used also for silverware chests. Great advances have been made in perfecting antitarnish coatings for woods and these materials, according to the claims of some manufacturers, have reached such a high point of perfection that metalwares can be left without any attention for many months and found to be just as bright and shiny as when they were stored. Precision manufacture and careful seasoning have made it possible to construct the chests themselves to a tolerance which does not permit any appreciable amount of damaging air to enter the storage compartments.

The fact that wooden boxes are relatively more expensive than those made of other materials is doubtless one of the greatest objections to wider use of them. Wooden containers are, however, becoming increasingly popular for packaging many items of merchandise not ordinarily stored in the receptacle in which they are sold. In such cases, the re-use feature is found valuable in the general public acceptance of a carefully-made wooden container as an accessory for household or office.

Plastics

Novelty packaging has been given added glamour by the re-introduction of plastic containers, in both transparent and opaque types. For further information, see the articles discussing plastics, starting on p. 431.

Novelty and re-use boxes have a definite and important place in the packaging picture because of their great merchandising value. The appeal of a beautiful, lasting container should not be underestimated.



PHOTOS 4, 5 AND 6, COURTESY ARROW MFG. CO.

4—(Left) The sturdy wooden box opens to reveal a jewel displayed against dramatic black velvet. 5—(Right) Box design repeats modern lines of watch.



6—Pearls are packaged in a handsome tray container which will serve also as a permanent jewel case.



PHOTO, COURTESY WARNER BROS. CO.

7—Strong in sales appeal and in construction is this perfume box covered in hand-colored velveteen.

Gift wrapping and packaging services

Desire for eye-appealing packaging has never been stronger than it is today. With bans off decorative materials, every user is striving for all the glamour he can possibly get with whatever supplies may be available.

Whether department stores resume extensive gift wrapping services depends entirely on the competitive demands for such operations as promotional aids.

Prior to the war many leading department and specialty stores offered a free gift wrap to every customer requesting one. Some of these were very elaborate, sometimes wraps of printed cellophane and foils. One store even used printed cellophane with a colored slip sheet. Some stores have offered specially designed wraps for Easter and other seasonal promotions.

During the war, due to shortages of materials and labor, many of these gift wraps were discontinued entirely or reduced to the simplest forms and shortest seasonal operations. Many stores, however, maintained the use of special holiday boxes, while others made use of the regular store boxes, but simply dressed them up with Christmas ribbon or tape.

Indications are that there will be new interest in this field of gift wrapping as decorative packaging materials reappear in abundant quantities. If store operators decide that free gift wraps will attract customers to their stores, others will soon follow suit. Even agreements to dispense with gift wraps cannot be maintained if competitive merchandising demands that the store continue this service.

In addition to a store's own gift boxes or wraps, a number of department stores maintain gift wrapping service departments where the customer pays the bill for the glamour packaging. Several metropolitan stores operate such services on a considerable scale, either managed by the store or rented to someone else on a concession basis.

One notable example of this service, store managed, is at Neiman-Marcus Co., Dallas, Tex. Started in the thirties, this gift wrapping service has continued right through booms, depressions and wars. Even when other stores couldn't make such operations pay, Neiman-Marcus must have known the formula for making gift wrapping profitable. Throughout the war period, although most decorative materials were unobtainable, this store developed sources for small quantities of left-over stocks, or used to best advantage whatever wrappings were available.

One reason for success is the novelty and eye appeal of the packages. Easter season, this store presented a gift package that looked like an Easter hat. Samples of the package were displayed in all departments with suitable gift merchandise, thus providing the store with a gala Easter promotion.

The store also specializes in gift wraps for special occasions—weddings, birthdays, Mother's Day, Father's Day, etc. Special papers are often designed for these. A birthday wrap, for instance, carries a musical motif of "Happy Birthday."

Labor problems have been solved by offering jobs in the gift wrapping department to women skilled in sewing or fine needlework, students from local art schools and others deft at handicraft.

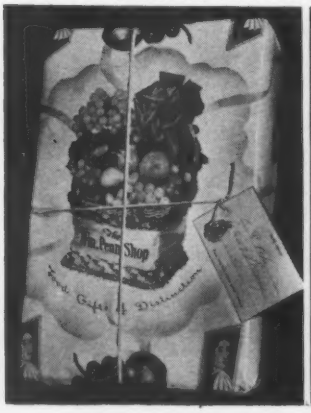
Mechanics of the gift wrapping are concealed, but display booths showing examples of the wraps prepared in the department are shown at strategic store locations. Customers are given numbers, so that they may do other shopping in the store while waiting for their purchases to be gift wrapped. Or they may wait in comfortable chairs placed near the gift wrapping booths, to give added customer service.

The store which does not wish to manage such a department as a part of store operation may find the answer by employing a gift wrapping and packaging service which will set up such a department and manage it on a concession basis. Through such plans, the service may be employed to work out complete details, give the benefit of its ideas on design, purchase materials and do the packaging. Organizations of this type should have broader scope with the return of a normal supply of materials.

Another outlet for gift packaging that is gaining popularity is the store which specializes entirely in packaged gifts. Such outlets usually have on display appropriate samples of packaged gifts for all occasions —weddings, births, birthdays, Mothers' and Fathers' Day, etc.—all packaged for eye appeal and priced according to the merchandise included and the elaborateness of the package.

(Left) Novel fruit design distinguishes basket wrap. (Right) Cut-out window makes effective wine package.

PHOTO, COURTESY PENN FRUIT CO.



PHOTO, COURTESY WINE ADVISORY BOARD



ADVERTISING FOR DECORATIVE PACKAGING

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Base Papers

FOR USE IN CONVERTING PROCESSES

In 1934, S. D. Warren Company committed itself to a program for the development of base papers for use in a variety of converting processes. The tasks of appraising the needs of the converting trades and applying research for the fulfillment of those needs were then assigned, and were thereafter progressed with care and deliberation.

War speeded the development program. Convertors served by the Warren Company absorbed an increased production, diverted it largely from the civilian trade, and employed it to fill military needs.

In consequence, the end of the war finds S. D. Warren Company with a line of tested base papers, with an appreciable capacity for manufacturing those papers, and with a well-founded research experience in the development of new papers — all of which are available for serving the peacetime needs of convertors.

Standard Products

The Copsecook Mill of S. D. Warren Company (at Gardiner, Maine) manufactures fine quality lightweight tissues exclusively. Warren's Cumberland Mills (at Westbrook, Maine) manufacture papers in normal weights.

In combination, these mills manufacture coated and uncoated base papers to standardized specifications that have been proved advantageous for designated converting uses.

Research Assistance

Over a period of years, the Warren Research Laboratory has developed numerous papers to meet common and uncommon needs — and these papers are available to convertors. If and when a converting requirement cannot be properly served by an existing Warren base paper, research effort may be applied to the end that a proper paper may be perfected and supplied.

To those convertors that require sound scientific assistance in the creation of base papers and in the developing of processing methods, the assistance of the Warren Research Laboratory is available.

Processing Possibilities

Base papers have been developed and manufactured by S. D. Warren Company especially for the processing operations listed herewith:

Pyroxylin lacquer coating
Synthetic lacquer coatings
Wax and hot melt coatings
Resin impregnating
Gumming
Coating with light sensitive substances
Water solvent coatings
Foil laminating
Transparent film laminating
Carbonizing
Insulation fabricating
Film casting

The base papers available for these purposes are adjusted to varying requirements of different processors.

Fields of Use

Warren base papers are currently being employed by convertors for the completion of these products:

Bags to hold liquid contents in freezing operations
Greaseproof wraps and bags
Rigid plastics
Water resisting papers
Paper printing plates for use on duplicating machines and small lithographic presses
Shelf coverings, place mats, etc.
Gum and candy wrappers
Soap wrappers
Box coverings and labels
Paper for interleaving rubber
Bag liners and bags
Greeting cards
Envelopes
Wall board liner
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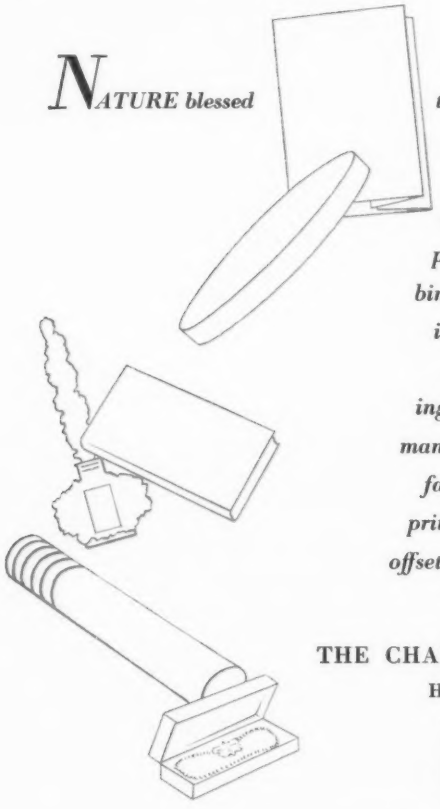


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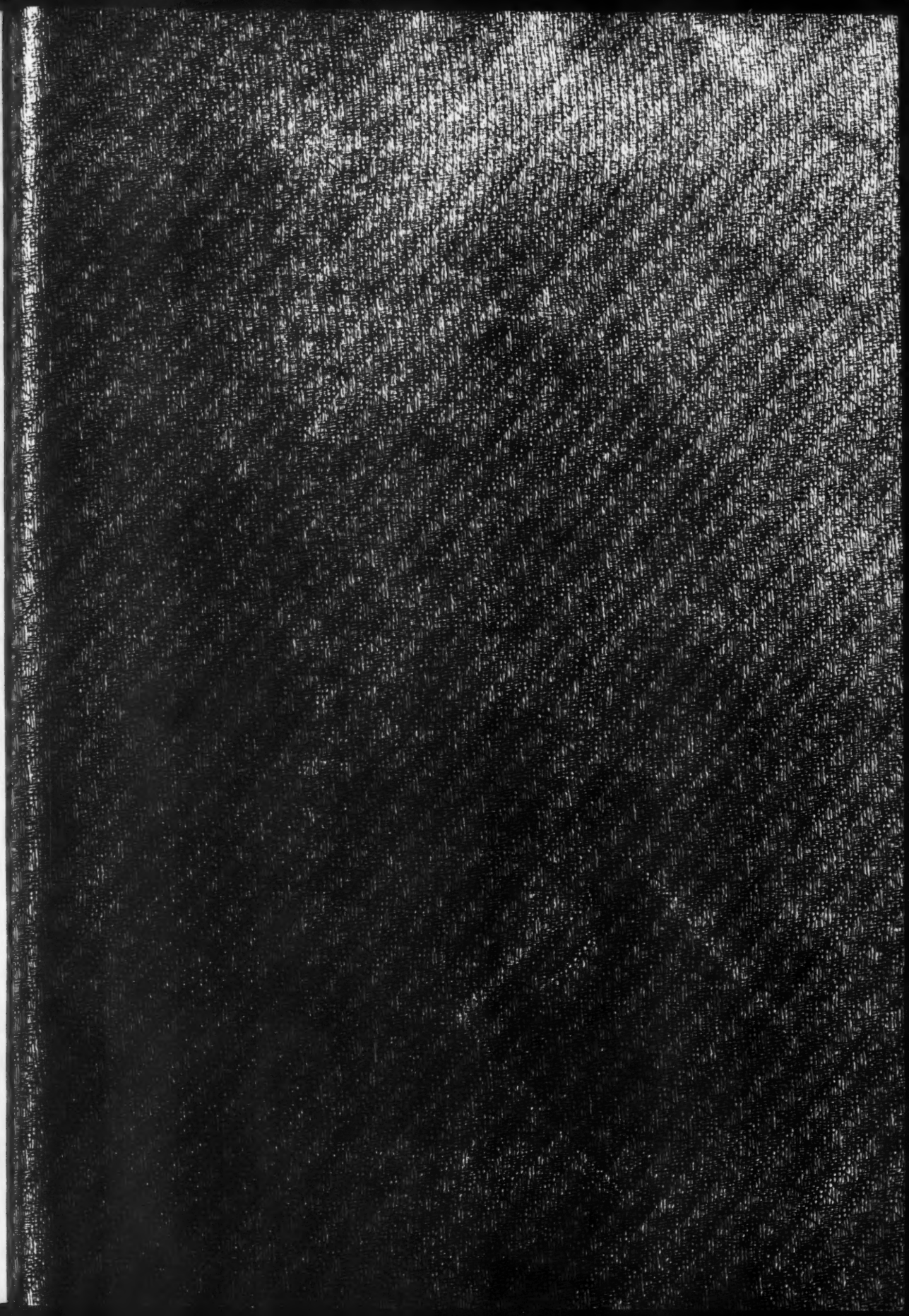
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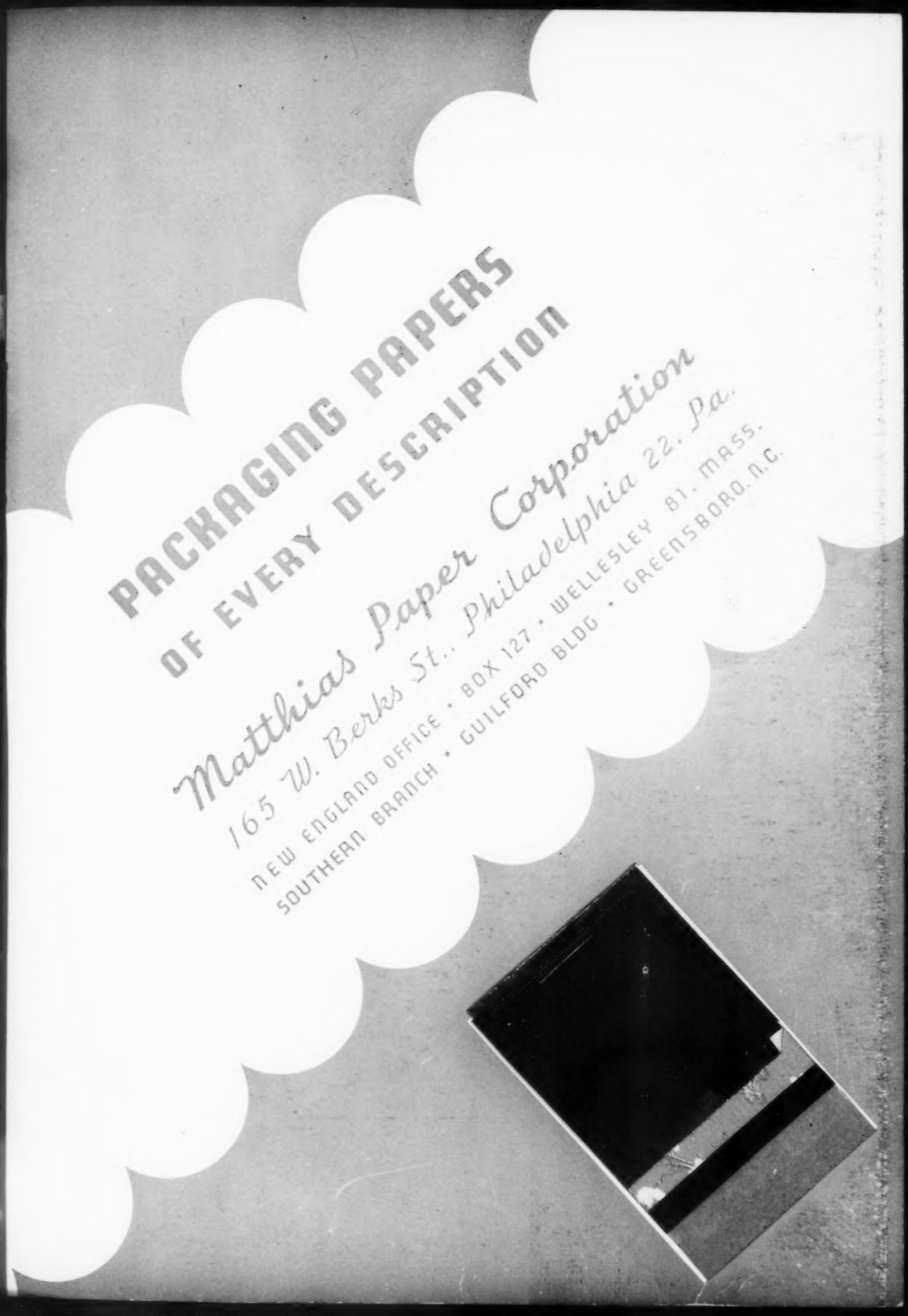
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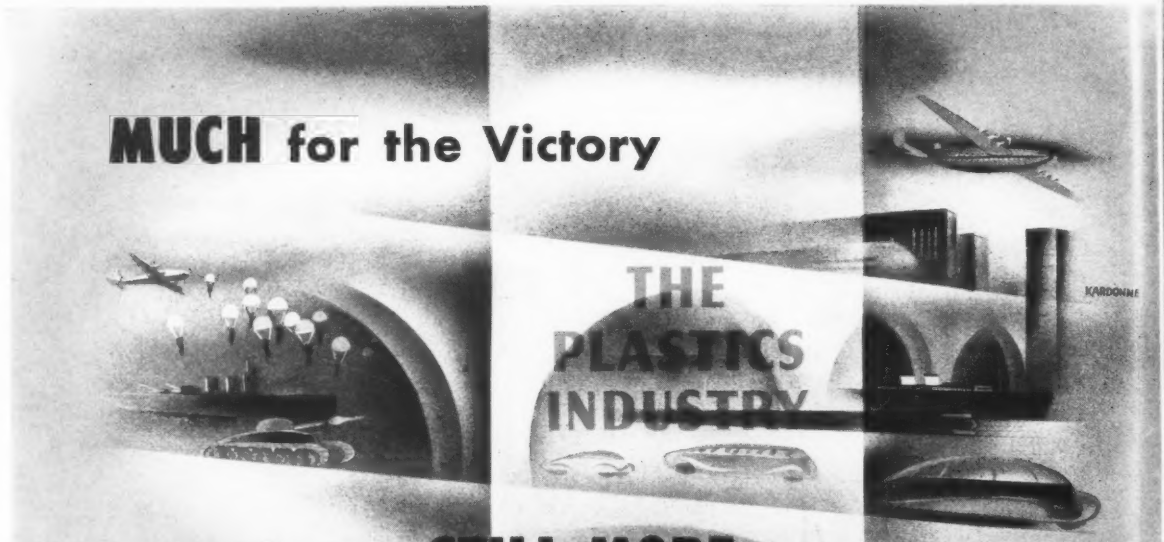
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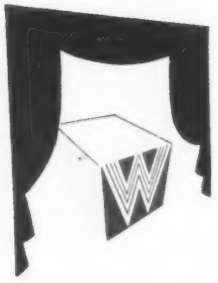
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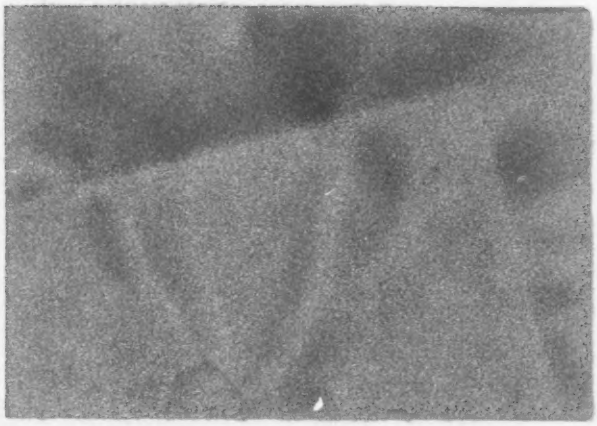
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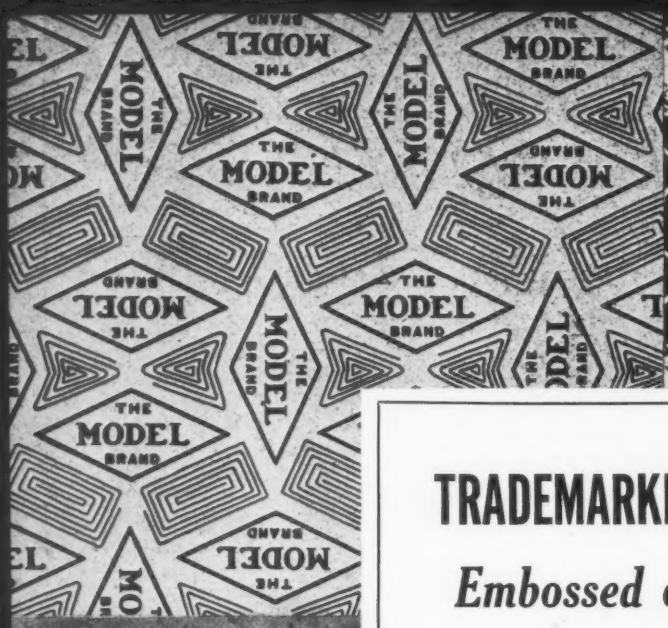
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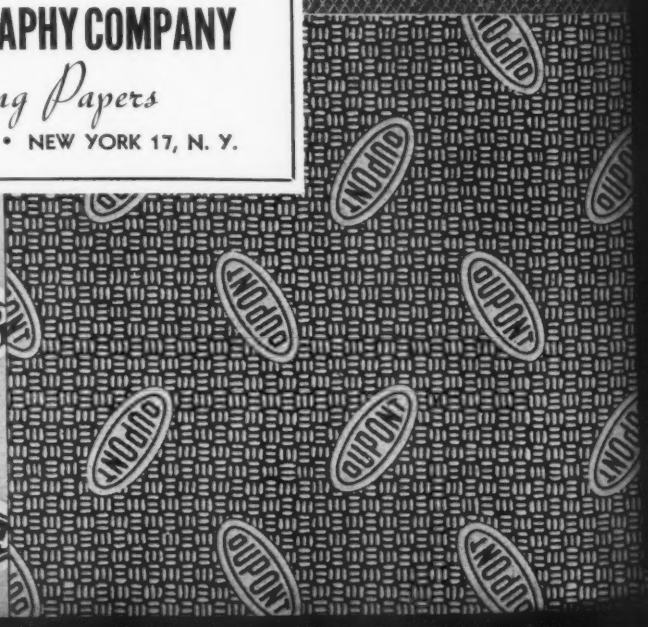
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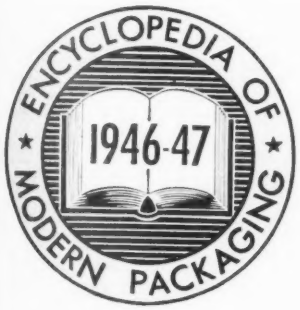


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ADHESIVES AND ADHESIVE TAPES



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Basic principles of adhesives

by Dr. F. C. Campins

An adhesive is a material in liquid or soft plastic condition for purposes of application, capable of changing to a semisolid jelly or to a hard film of high cohesive ability and suitable bonding power. The methods by which adhesives change from the liquid to the solid state are: by change of concentration of a volatile liquid ingredient and/or by change of temperature and/or by change of chemical composition. These processes serve to classify adhesives (see chart opposite p. 546) as follows. All commercial types of adhesives are:

1. Solvent adhesives
2. Temperature-sensitive cements
3. Chemical cements

Since initial cost of an adhesive seldom amounts to 1 per cent of the cost of the finished product, the adhesive should be selected only in the light of long term economy as reflected by increased production, decrease in waste, more satisfactory quality and other similar considerations which may be involved.

Requisites and characteristics

In general, a good bond has greater strength than the surfaces it adheres. See Table III, on chart opposite p. 546.

Not only must an adhesive bond surfaces so that they will stand up under the field requirements of package life, it must permit ready operation in the applicator and must develop a preliminary bond at a sufficiently rapid rate to permit maximum machine efficiency.

It is obvious that the extent of preliminary setting required of an adhesive will vary from job to job. In some elementary cases, the initial tack of the adhesive is sufficient. Even though the adhesive may take considerable time to adjust itself fully to its surroundings, preliminary setting should be expedited to an extent whereby the freshly bonded package may withstand the necessary handling.

Final bonds between surfaces generally fall into two classes (Table II on chart opposite p. 546):

1. The adhesive film may finally set in a plastic mass, usually pliable. This is called a *plastic bond.*
2. The adhesive film may finally set into a hard, glassy material which may break when the bond is bent, but which continues to supply a film *across* the surfaces—the film being anchored into or between the fibres. This film forms a *penetration or mechanical bond.* However, it need not be continuous along the surfaces being adhered.

All adhesives in the preliminary setting stage give a plastic bond. Thus, many cold vegetable adhesives, after sufficient preliminary setting to hold the surfaces together, make a plastic bond which, in those cases where the adhesives finally dry out to a hard, brittle condition, must be replaced by a penetration bond.

Adhesion generally occurs between the surface layers. Therefore the adhesive bond should not be held responsible for failures due to discontinuity of structure, cracks, zones of low tensile strength and similar conditions below the surfaces.

The adhesive should wet the surface to which it must subsequently adhere. It must preserve continuity across the surfaces to be bonded. This means that:

1. The surfaces should be brought together while the film of glue is active.
2. The adhesive should not be a crystalline, but rather a colloid type of material.
3. Porous or absorbent surfaces necessitate controlled penetration of the adhesive between the instant of application and the time when preliminary setting occurs—that is, the properties of the adhesive must counterbalance the properties of the surfaces. (See chart on opposite page.)

The strength of the adhesive should be keyed to that of the material. Thus the strength of adhesives used for bonding papers is lower than that of adhesives used for woodwork.

Common causes of failure of final bond

Even when all conditions of contact, time, etc., for bonding prevail, final failure of the bond may occur over a short or long period. In the following paragraphs are discussed some of the common causes of failure of the final bond in both solvent types and cement types of adhesive. Solvent types of adhesive include the products made liquid or semiliquid by the presence of volatile liquids used to dissolve and/or suspend the adhesive ingredients. Cement types are those which change from the liquid to the semisolid state without loss of solvents. Solder and Portland cement are examples.

Failure of solvent types

Where solvent adhesives are concerned, final failure is mainly tied in with the solvent, and may be caused by one or another of the following conditions:

Inability to lose solvent—Retention of solvent prevents setting. This may result from the imperviousness of both surfaces to diffusion of the solvent, in which case the adhesive would never dry. See Table III on chart opposite p. 546.

Tempering or allowing evaporation of the solvent before bringing the sheets together, may be effective where the adhesive develops a high lingering tack and is of a plastic nature, and this expedient is often used in handling transparent tissues. Another cause for retention of solvent is that the surroundings and the materials to be adhered may be saturated with the vapor of the solvent and so unable to remove solvent from the adhesive.

Shrinkage on drying from loss of the volatile solvent—This factor is unnoticed where one of the surfaces is pliable and can follow the shrinking glue film. Where the surfaces are rigidly separated, however, the forces set up by shrinkage often disrupt the glue film and lead to failure of the bond. This is sometimes incorrectly referred to as crystallization.

Excessive penetration due to excessive solvent—As the body of the adhesive may be varied by regulating the amount of solvent, its dilution should be held within certain limits to avoid excessive penetration between the time of application and the setting or bodying-up of the product to a degree sufficient to stop penetration. The slower-setting glues, as a class, are generally used with heavier bodies to compensate for this. All the factors come into evidence when these adhesives are used on porous surfaces.

Temperature limits in storage and use due to solvent—The adhesive should be stored and used within the proper temperature range where the solvent is liquid.

Solvent action on the sheeting, inks, etc.—Often some of the liquid ingredients in the adhesive exert action on the stock, ink, etc., which makes the adhesive unsuitable for the job. Such effects include blocking, bleeding and blistering.

In blocking, the adhesive solvents partially dissolve and soften the sheeting as they seep or migrate through it, to adhere to other sheeting packed in close contact. In aqueous adhesives, e.g., envelope gums, moisture reactivation achieves the same result.

Bleeding results if a solvent in the adhesive attacks the inks or colors, causing them to fuzz, run, blot, stain or show through. This is particularly apt to happen when the solvent is not very volatile and has a strong affinity for the sheeting.

Too active a solvent or swelling action on the sheeting causes bulging or blisters.

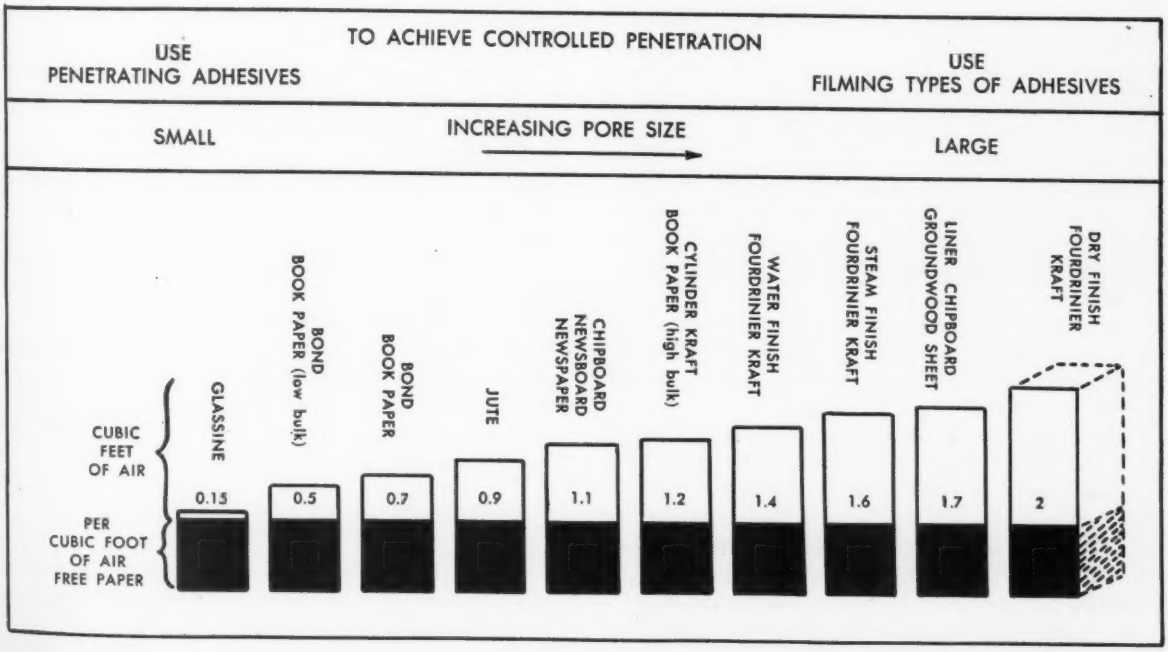
Inadequate penetration of nonplastic types—If one of the faces does not permit a penetration bond into or between the fibres, then, where the adhesive dries out to a nonplastic substance, bond failure will occur at this face and the glue film will pull away therefrom while adhering to the other face.

Failure of cement types

Due to the nature of cement adhesives, they can set on nonporous or vaporproof surfaces. The final bond may be of the plastic or the penetration type. Thermoplastic adhesives generally give plastic bonds, and failures of this class of bond generally are of the following nature:

Cold flow failure—While the plastic adhesive should have a yield point greater than any constant tension to which the bond is exposed so as not to flow, in practice the yield point is often below this, and if the final bond is under a continuous tension, failure may occur through a tendency to flow. This effect is more pronounced in warm weather.

Embrittlement failure—The plastic adhesive may, under certain conditions, lose its plasticity and exhibit low tensile bond strength due to the loss of the plastic or suction bond and/or to embrittlement. Thermo-



plastic cements often exhibit embrittlement at low temperatures. Chemical cements may set to a hard glassy material, and a penetration bond must be established either into or between the fibres of both surfaces before final setting, or failure is likely to occur.

Assuring a good bond

Manipulation of a suitable adhesive should be approached from three major aspects:

1. The adhesive itself
2. The mechanism for application
3. The surfaces to be bonded

Factors concerned with the adhesive—Cold glues should be at room temperature before dilution, as products chilled by exposure to low temperatures would be unduly heavy and so induce the user to add more water than is necessary. Heat will thin out most glues, so that the proper working consistency can be attained with reduced dilution, or even with no dilution at all.

Dilution should be accurate. If adhesives are thinned beyond the limitations outlined by the supplier, the solids in the glue will be carried too deeply into the stock, leaving an inadequate film between the surfaces. On the other hand, insufficient dilution may lessen the degree of penetration to a point below that which is necessary to secure anchorage.

It is advisable to keep the container covered to avoid any thickening by evaporation, or any contamination by dirt.

Mechanism for application—To ensure proper mechanical operation and ready transfer of the adhesive from the glue pot to the surfaces being bonded, the body or consistency of the adhesive in the glue pot must be kept within a given range. As the glue thickens in the pot through evaporation, it should be thinned, preferably with a special dilute glue mixture. This can be prepared by thoroughly mixing one part of glue with two parts of solvent. If volatile solvents are used, a cover is desirable to retard thickening of the glue through evaporation.

When the body of the adhesive is regulated by temperature, e.g., where glues are applied at temperatures above that of the room, overheating will cause excessive thinning, which results in splashing. Other harmful effects are burning and decomposition. To hold the temperature of the glue substantially constant, the glue pot should be jacketed with water or some other liquid which is kept hot by a thermostatically controlled heater.

True surfaces on the applicator are necessary for uniform transfer of adhesive to the desired area. This may mean periodic cleaning of the surfaces. The applicator should provide means both for regulating the thickness of the film and for ensuring uniform thickness throughout the film. Thickness of film should be adjusted for the regular production rate of the machine.

The surfaces to be glued—These should come into uniform contact with the applicator, receiving a thin, even film of the adhesive. After contact is established by some device, such as a compression belt, strain is avoided until the adhesive has set sufficiently to effect a bond across the surfaces and so permit the handling of the package.

To avoid trouble with cold stock, it is advisable to store it under operating-room conditions. Damp or green stock (or even seasoned stock in unduly damp weather) tends to slow up operations. Stock should be supplied from storage properly seasoned.

Meeting field conditions

The adhesive supplier knows that his product must meet field conditions after a satisfactory bond is accomplished under room conditions. Redevelopment of excessive flow will lead to bond failure. The common conditions which bring about this flow affect many types of aqueous adhesive and include high temperature, high humidity, low temperature and wetting.

High temperature—Most plastic adhesives—particularly thermoplastic adhesives—will soften at high temperatures. Where the bond is under a constant tension, the viscous flow of the adhesive ultimately will cause it to yield. The same condition occurs at a decreased rate at room temperature.

High humidity—Although aqueous adhesives use water to render them liquid, they often have only a limited affinity for water vapor. Therefore most case-sealing glues once dried will remain in the solid state even at 100 per cent relative humidity, when they may in some cases pick up only, say, 10 to 14 per cent moisture, permitting shipments to the tropics.

Other aqueous adhesives may have various hygroscopic or moisture-absorbing ingredients added thereto to secure bite, plasticity, etc. These may draw sufficient moisture from moist air to partly or wholly liquefy. Flow failure will then occur.

Low temperature at high relative humidity—This case is included for completeness; but here, even though the adhesive will absorb its quota of moisture, the low temperature will usually keep the viscosity of the adhesive sufficiently high to obviate the trouble from excessive penetration. (See also the paragraph on temperature embrittlement, p. 545.)

Actual wetting—This will actually remoisten the aqueous adhesive and so promote partial or total penetration as described above. A common unsuspected case is the sweating which occurs if moisture is deposited in closed freight cars when their temperature drops off at night; after the interior of the car has previously developed a high R.H. during the hot daytime temperatures due to materials that give off water vapor.

Causes of failure in the field

It will be noted that failure may be due to surface or stock, as well as to the adhesive. We shall discuss here the more common types of failure:

Bond embrittlement or crystallization—This embrittlement of the bond may be due to physical and/or chemical causes, and both stock and adhesive should be examined for responsibility. Aging or migration failure paralleling the migration of hygroscopic ingredients is commonly found in the bonding of certain transparent tissues where the affinity existing between certain liquid ingredients of the adhesive and the stock can slowly cause their migration. The resulting embrittlement of either the film of glue or the sheeting itself, called aging failure, is usually a slow process requiring many months. To be quite safe commercially, the estimated life of the package in the field should be well within this period.

Two other causes of trouble are migration of the plasticizer away from the adhesive into the sheeting, which may result in embrittlement of the glue and so in failure of the plastic adhesive bond; and migration of the plasticizer away from the sheeting into the glue, resulting in a loss of pliability of the stock. It should be noted that the plasticizer, usually a nonadhesive liquid ingredient, should remain in the adhesive to assure plasticity in the final bond. Ideally the plasticizer should have no effect on the sheeting, but it often has some solvent action.

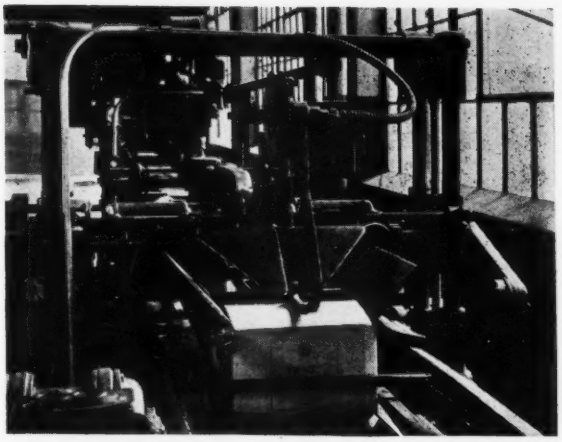
Temperature embrittlement—Sometimes only very limited amounts of migration occur in the process of setting, but the ingredients may be of a kind which would cause subsequent embrittlement of the stock or adhesive if the adhesive bond were ever to be subjected to heat.

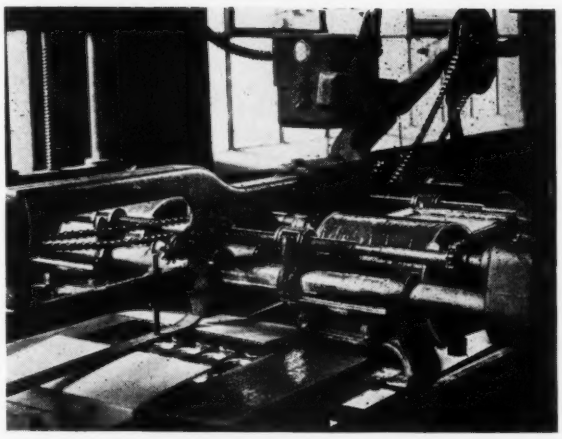
Loss of tensile strength may occur from a variety of causes affecting the adhesive or the stock. Certain water-insoluble adhesives may swell on prolonged submersion in water, thus losing tensile strength even though still solid. In other cases the stock itself may lose strength at high humidities.

Rupture away from the surfaces is often due to differential expansion, i.e., the adhesive film and the stock expand at different rates under the field conditions, destroying film continuity across the surfaces.

When the bonded surfaces are immersed in hot wax, bond rupture could well occur through this cause, possibly aided by embrittlement.

When the bonded surfaces are immersed in water, differential expansion under moisture may cause rupture. Thus where two sheets of parchment are adhered with a nonaqueous adhesive—which is also water-insoluble—it may at first appear that this bond would stand prolonged submersion. In most cases it does not, because the parchment expands on submersion while the glue film does not—resulting in rupture.







PHOTOS, COURTESY ARABOL MFG. CO. AND R. M. HOLLINGSHEAD CORP.

Case sealing adhesives must bond quickly and firmly. 1—(Top) Case entering the machine. 2—(Center) Rollers applying the adhesive to the flaps. 3—(Bottom) Cases emerging from the machine after being sealed.

Meeting machine requirements

Uniform liquid condition is necessary for proper application. Further, because the adhesive may need more or less time to achieve the right degree of preliminary setting for bond formation, it is helpful to have a prolonged tension-free contact between the freshly bonded surfaces to allow for the setting, making no mechanical demands upon the adhesive until this preliminary setting is accomplished. In the interest of ensuring bonding under the most adverse conditions, a longer time for the package under pressure in the sealing machine is very desirable. In this way, unsatisfactory bonds may often be avoided.

In order that a glue-using machine may handle a wide variety of adhesives the following conditions must prevail:

1. Negligible evaporation during application
2. Negligible temperature change in application
3. Negligible mechanical strain upon adhesive prior to preliminary setting
4. Prolonged tension-free contact period between the freshly bonded surfaces

Types of applicator

No attempt is made in this article to do more than explain the theory and principles underlying various types and mechanisms for applying adhesives. The practical aspects and illustrations of actual devices are presented in the article, *Equipment for Applying Adhesives*, p. 554.

Glue applicators fall into three classes:

1. Direct applicators
2. Direct transfer mechanisms
3. Translatory (or indirect transfer) mechanisms

Direct applicators—These can usually be readily protected against evaporation of solvents by a slotted cover, the glue roll partly projecting through the slot. Further, since the sheeting comes into direct contact with the roll that rotates in the glue, if the pot is heated, there is little undue loss of temperature in the applicator. Thus hot glues (hot melts, etc.) are permissible on these units. In general, therefore, this type of mechanism allows a wide choice of adhesives.

Direct transfer mechanisms—In contrast to the direct applicator, this type permits "spot printing" of the adhesive while the web of paper is in continuous motion. It will readily be noted that this mechanism ordinarily allows a fair amount of evaporation, and if the adhesive in the pot is heated, there is an appreciable drop in temperature by the time it reaches the unheated segment of the transfer roll. These factors restrict the use of hot melts and of adhesives which have extremely volatile solvents.

Translatory mechanisms—This indirect transfer provides great scope for evaporation of solvents as well as for cooling the adhesive between a heated glue pot and the surface receiving the adhesive. Thus, hot glues and volatile solvent types are impractical and are usually out of the question.

Rate of setting

If a given operation is standardized, it is more desirable to select the *specific* adhesive which will yield the most efficient production compatible with the field requirements.

After arriving at a decision as to the proper adhesive, the next issue of great concern to the operator is how to use it to best advantage. This usually means how to secure the most favorable rate of preliminary setting for the specific adhesive.

On the production line, the requisite extent of preliminary setting which must occur within the time of tension release (i.e., the time of tension-free contact between the freshly bonded surfaces) provided by the mechanism, determines the rate of whatever preliminary setting may be required.

Thus where the time of tension release appears inadequate or where the adhesive is not exhibiting a rapid enough rate of preliminary setting, relief may be had in the following ways:

1. By reducing the total tension on the bond (more effective scoring, different grain direction, etc.)
2. By increasing the area glued off
3. By making provision to increase the setting rate of the adhesive (by manipulation of the adhesive, the stock, etc.)
4. By providing a longer time of tension release through longer compression, or through longer stacking time

According to the properties of a given adhesive, its rate of setting may be accelerated by hastening the concentration of solid ingredients, by speeding up the effective change in temperature, or by quickening the chemical reaction.

Concentration of solid ingredients may be hastened by partial evaporation of solvents prior to bringing the surfaces together; by the solution of part of surface in the adhesive (the resultant mixture itself being an adhesive), or by preferential removal of the solvent (seepage, or what is known as preferential migration of certain liquid ingredients).

Change of temperature, when appropriately used, may increase the body of an adhesive by physical means or by effecting or accelerating chemical reaction.

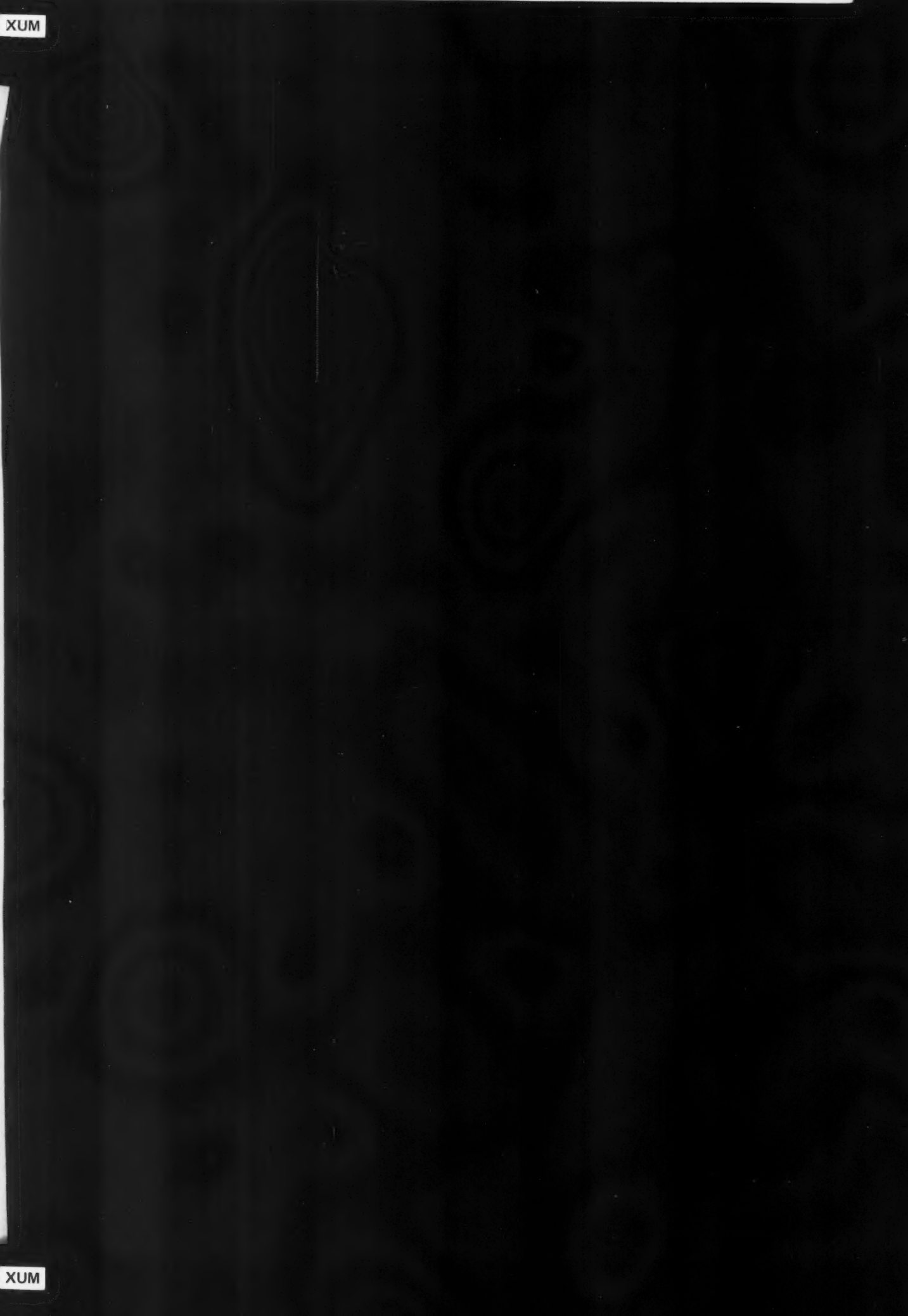
If adhesives set through chemical reaction, this may be quickened not only by change in temperature but also by other factors in the surroundings—either by interaction or catalysis.

Conclusion

The foregoing discussion brings out clearly that the achievement of successful adhesion always involves a number of factors, prominent among which are the nature of the surface, the field requirements and the machine factors.

Further, as it often is the function of the adhesive to perform more or less mechanical duties while still yielding clean, efficient production at the maximum rate, these factors in themselves have to be balanced against each other in the process of formulation of the adhesive.

All the above-mentioned factors must be weighed against and compared with each other—placing stress upon the major demand of the situation and compromising on other details. Numerous adhesives are produced by responsible manufacturers and are balanced for a given operation. Selection and application of an adhesive according to the principles outlined, should result in optimum success.



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TABLE I.—CHARACTERISTICS OF ADHESIVES

A. SOLVENT (Liquid-Activated) Types: (At least one of the surfaces being adhered must permit the diffusion of the volatile liquid ingredient which usually plays no part in the final bond)

AQUEOUS PHASE CONTINUOUS			NON-AQUEOUS PHASE CONTINUOUS	
Aqueous Adhesives that are true (or nearly true) solutions	Colloidal Solutions		Lacquer-Type Adhesives that are true (or nearly true) solutions in organic solvents	Colloidal Solutions
	Of materials that dissolve and usually have an affinity for water. Usually viscous	Dispersions or Emulsions of materials that have little affinity for water, in water or in other aqueous adhesives.		
	Commercial types			
Slow drying Vegetable Adhesives	Most Aqueous Vegetable Glues Silicates Many Cold Protein Glues Gum Arabic	Natural and/or synthetic resin and/or rubber emulsions	"Cellu-Gums" Clear Lacquer Adhesives for use on transparent sheetings	Wax Gums

B. CEMENTS: (Both faces may be impervious to all vapors from solvents)

THERMOPLASTIC CEMENTS		CHEMICAL CEMENTS
Aqueous Types	Non-aqueous Types	Synthetic Resins (Polymerization or Thermosetting Types)
Commercial types are:		
Some Flexible Animal Glues (where loss of water not necessary to the final bond)	Hot Melts	Synthetic Resins

TABLE II.—TYPES OF ADHESION AND SUITABLE ADHESIVES

Type of Adhesion	Surface Requirements	Type of Adhesive	Used on
Penetration Bond	Both surfaces must be absorbent, wettable by adhesive, and permit the diffusion of the solvents	Usually cold aqueous adhesives of solvent type that dry out to brittle films. (Any type that dries to a brittle film would utilize this type of bond)	Porous Materials } Open Paper Stocks (See Note 1.)
Plastic Bond	At least one surface must permit diffusion of solvents	Solvent Adhesives that dry out to Plastic Films	Smooth, usually less porous surfaces } e.g., For Aqueous Adhesives—Glassines, Bond Papers For Lacquer Type Adhesives—Transparent Tissues
	Neither surface will permit the diffusion of solvents i.e. impervious surfaces	Cements, e.g., Thermoplastic Adhesives	Smooth, non-porous surfaces } e.g., Foil to Itself Certain Plastics (See Note 2.)

A special case for "solvent adhesives" occurs where two surfaces of the same material are soluble in some solvent which can be used to partly dissolve the surfaces and form a solute bond or weld after the solvent has evaporated. This case merely falls in the class of solvent-activation or re-moistening as the solvent is not the adhesive. An analogous case for "cements" is where two surfaces of the same material are thermoplastic and so can be heat-activated and welded together.

Note 1: Thin films should be used as glues giving penetration bonds generally dry to inherently brittle films.

Note 2: Plastic bonds are also made between porous surfaces; glue film may be thick.

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TABLE III.—SUMMARY OF PROPERTIES AND USES OF ADHESIVES

roperty of Surface	Commercial Examples	Type of Adhesive			Requirement of Final Bond	Nature of Adhesive
		Solvent		Cements		
ge-proofing)		Aqueous	Non-aqueous	Thermoplastics		
ner Grease-oof nor mois-reproof	Most ordinary papers, kraft papers and paperboard for converting (permit ready diffusion of water and other vapors)	Most generally used	OK for water-resistant bonds	Non-aqueous types OK for water-resistant bonds	Frequently penetration bond of low tensile strength but stronger than the stock	Generally the several types aq. vegetable glues, silicate Hot aqueous protein glues where high tack necessary
	Wood	Generally used	Usually NG	Chemical cements for water resistance	As above but need higher tensile strength to be stronger than stock	Aq. vegetable glues (occasionally) Aq. Protein Glues (e.g., Fish, Animal, Casein) Types Chemical Cements (e.g., Plywood Resin)
seproof	P. T. Cellophane, Acetate permits the diffusion of the water vapors of organic solvents	Frequently used	OK for water-resistant bonds	Thermoplastics also OK where water resistance and no solvent odor desirable	Generally Plastic Bond	Aqueous (Latex and Vegetable) Glues and Lacquer-type adhesives most often used
	Glassine, Grease-proof Paper, Parchment (permit the diffusion of moisture but not the vapors of organic solvents)	Frequently used	NG	Thermoplastics OK	Generally Plastic Bond	Usually slow drying, aqueous vegetable glues
tureproof	M. P. Cellophane, M. P. Acetate lacquered glassine	NG	OK	OK	Plastic Bond	Usually slow-drying lacquer-type adhesives
	Pliofilm	NG	OK	Material itself is thermoplastic	Plastic Bond	Usually heat-sealed to itself
tureproof and rganic-Solvent-apor-Proof	Many Plastics, Metallic Foils	NG	NG	OK	Plastic Bond	Thermoplastic resin type adhesive

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TABLE I.—CHARACTERISTICS OF ADHESIVES

A. SOLVENT (Liquid-Activated) Types: (At least one of the surfaces being adhered must permit the diffusion of the volatile liquid ingredient which usually plays no part in the final bond)

AQUEOUS PHASE CONTINUOUS		NON-AQUEOUS PHASE CONTINUOUS
Aqueous Adhesives that are true (or nearly true) solutions	Colloidal Solutions	Lacquer-Type Adhesives that are true (or nearly true) solutions in organic solvents — Colloidal Solutions
	Of materials that dissolve and usually have an affinity for water. Usually viscous — Dispersions or Emulsions of materials that have little affinity for water, in water or in other aqueous adhesives.	
	Commercial types	
Slow drying Vegetable Adhesives	Most Aqueous Vegetable Glues; Silicates; Many Cold Protein Glues; Gum Arabic — Natural and/or synthetic resin and/or rubber emulsions	"Cellu-Gums"; Clear Lacquer Adhesives for use on transparent sheetings — Wax Gums

B. CEMENTS: (Both faces may be impervious to all vapors from solvents)

THERMOPLASTIC CEMENTS		CHEMICAL CEMENTS
Aqueous Types	Non-aqueous Types	Synthetic Resins (Polymerization or Thermosetting Types)
Commercial types are:		
Some Flexible Animal Glues (where loss of water not necessary to the final bond)	Hot Melts	Synthetic Resins

TABLE II.—TYPES OF ADHESION AND SUITABLE ADHESIVES

Type of Adhesion	Surface Requirements	Type of Adhesive	Used on
Penetration Bond	Both surfaces must be absorbent, wettable by adhesive, and permit the diffusion of the solvents	Usually cold aqueous adhesives of solvent type that dry out to brittle films. (Any type that dries to a brittle film would utilize this type of bond)	Porous Materials — Open Paper Stocks (See Note 1.)
Plastic Bond	At least one surface must permit diffusion of solvents	Solvent Adhesives that dry out to Plastic Films	Smooth, usually less porous surfaces — e.g., For Aqueous Adhesives—Glassines, Bond Papers; For Lacquer Type Adhesives—Transparent Tissues
Plastic Bond	Neither surface will permit the diffusion of solvents i.e. impervious surfaces	Cements, e.g., Thermoplastic Adhesives	Smooth, non-porous surfaces — e.g., Foil to Itself; Certain Plastics (See Note 2.)

A special case for "solvent adhesives" occurs where two surfaces of the same material are soluble in some solvent which can be used to partly dissolve the surfaces and form a solute bond or weld after the solvent has evaporated. This case merely falls in the class of solvent-activation or re-moistening as the solvent is not the adhesive. An analogous case for "cements" is where two surfaces of the same material are thermoplastic and so can be heat-activated and welded together.

Note 1: Thin films should be used as glues giving penetration bonds generally dry to inherently brittle films.

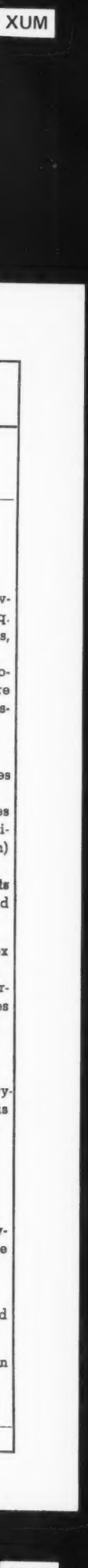
Note 2: Plastic bonds are also made between porous surfaces; glue film may be thick.

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TABLE III.—SUMMARY OF PROPERTIES AND USES OF ADHESIVES

Property of Surface	Commercial Examples	Type of Adhesive			Requirement of Final Bond	Nature of Adhesive
(Age-proofing)		Solvent		Cements		
		Aqueous	Non-aqueous	Thermoplastics		
Neither Greaseproof nor moistureproof	Most ordinary papers, kraft papers and paperboard for converting (permit ready diffusion of water and other vapors)	Most generally used	OK for water-resistant bonds	Non-aqueous types OK for water-resistant bonds	Frequently penetration bond of low tensile strength but stronger than the stock	Generally the several types aq. vegetable glues, silicate Hot aqueous protein glues where high tack necessary
	Wood	Generally used	Usually NG	Chemical cements for water resistance	As above but need higher tensile strength to be stronger than stock	Aq. vegetable glues (occasionally) Aq. Protein Glues (e.g., Fish, Animal, Casein) Types Chemical Cements (e.g., Plywood Resin)
Greaseproof	P. T. Cellophane, Acetate permits the diffusion of the water vapors of organic solvents	Frequently used	OK for water-resistant bonds	Thermoplastics also OK where water resistance and no solvent odor desirable	Generally Plastic Bond	Aqueous (Latex and Vegetable) Glues and Lacquer-type adhesives most often used
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Moistureproof	M. P. Cellophane, M. P. Acetate lacquered glassine	NG	OK	OK	Plastic Bond	Usually slow-drying lacquer-type adhesives
	Pliofilm	NG	OK	Material itself is thermoplastic	Plastic Bond	Usually heat-sealed to itself
Moistureproof and Organic-Solvent-Vapor-Proof	Many Plastics, Metallic Foils	NG	NG	OK	Plastic Bond	Thermoplastic resin type adhesive

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Types of adhesives

by Arthur Biddle

The adhesive is an excellent example of a paradox. It is at the same time one of the oldest as well as one of the youngest commercial enterprises. Modern science has introduced new materials and new techniques into a time-honored trade. Before the advent of synthetic resins, adhesives consisted of a large group of natural materials, all having the same disadvantages of lack of uniformity and low resistance to moisture and temperature. Most of them were also excellent culture mediums for micro-organisms. With the growth of the synthetic resin industry, however, it became apparent that many of these new substances would provide excellent bonds to a number of surfaces.

Evaluation of adhesives

Adhesives, however, can no longer be considered entirely in the light of their own characteristics and functions. They must be judged according to end uses, in relation to the surfaces on which they are to be used and from the aspect of handling. Inasmuch as metal foils and plastic webs are established packaging mediums, adhesives must possess qualities not heretofore required since their previous applications were confined mostly to paper or wood.

It is as necessary, therefore, to study the sheets or webs as it is to know the adhering substance itself. For example, in laminating films such as cellulose or vinyl acetate, ethyl cellulose or cellophane, to glassine or parchment, the choice of laminant is dependent to a large extent on the plasticizer used in both the film and the paper. If the plasticizers are not compatible with the adhesive used, poor bonding will result. Moreover, such physical and chemical reactions as corrosion, bleed, cold flow, crystallization and solvent action on the web are now recognized as of the same importance as adhesion, water resistance and the other qualities previously given foremost consideration. While inadequacy in any of these characteristics may prevent an adhesive from being used alone for a given purpose, combinations of two or more adhesives may prove to be satisfactory.

Thus, taking into account peculiarities of the web, machine operation, climatic conditions, storage and transportation, the characteristics of an adhesive are evaluated on a sliding scale. If stiffness is desired under certain conditions, it may be found in one glue—for example, silicate of soda. In another event, a degree of stiffness may be sacrificed in favor of water resistance, and casein selected as the adhesive for that purpose. Or, a combination of adhesives might be used to give optimum results in both qualities for a particular use.

With the vast number of possibilities for combinations in adhesive formulations and the various characteristics which result from these combinations, it is little wonder that laminators or glue room foremen are often at their wits' end to maintain production that is trouble free.

The newer formulations will give excellent results only if their application is as "hand-tailored" as the adhesive itself. Often a change of equipment as well as close control of the bonding cycle are required. In order to handle adhesives efficiently and judge them properly for end uses, their functions and peculiarities should be more clearly understood in relation to surfaces and operating conditions.

Nature of adhesion

The investigation into the nature of adhesion has as its objective the establishment of the most desirable physical and chemical properties for an adhesive between two given surfaces. In the past two decades, considerable interest has been aroused in this subject. Probably the greatest effort in this direction was that undertaken in Great Britain, the results of which are described in the three reports[1] of the Adhesives Research Committee, under the auspices of the Department of Scientific and Industrial Research. The greater part of this investigation was conducted by J. W. McBain and his co-workers. At the same time work was being conducted in this country at the U. S. Forest Products Laboratories by F. L. Browne and T. R. Truax. Both organizations were interested in the mechanism whereby two surfaces of an adhesively formed joint are held by the adhesive.

McBain, as a result of his investigations,[2] arrived at the conclusion that two types of bonded joints may be formed: *mechanical*, or bonds between porous surfaces; and *specific*, or bonds between smooth dense surfaces. Browne and Truax maintained that although some of the strength of the bond between two porous surfaces must be attributed to tendrils of adhesive which enter the pores, this mechanical interpenetration accounts for only a small fraction of the joint.

Evidence is accumulating in every pertinent field that the molecular attractive forces are responsible for the bond between any two surfaces. It is apparent that the primary consideration in selecting a suitable adhesive for a given surface is an evaluation between the active groups on the molecules of the adhesive and the surface. Obviously, the best adhesion is given by substances which have a greater adhesive attraction for the surface than cohesive attraction within themselves.

[1] Reports of the Adhesives Research Committee, 1, 2 and 3, H. M. Stationery Office, London.

[2] R. C. Rinker and G. M. Kline, "Survey of Adhesives and Adhesion, Part I," Modern Plastics XXIII, No. 2, 196 (Oct., 1945).

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Too little cohesive attraction, however, results in an unsatisfactory bond in the sense that the adhesive itself may be torn apart. Space does not permit entering into a lengthy discussion of the technical details of these phenomena.[3]

With the development of the synthetic or even the natural high polymeric adhesives, improved bonding characteristics and strength properties as well as water resistance and other qualities have been obtainable. These high polymeric materials include all substances which may be considered as consisting of large multiples of monomeric units, formed either by polymerization or by condensation. Cellulose, rubber and vinyl resins are examples of high polymeric materials used in adhesives. There are two general types of these compounds: thermoplastic and thermosetting. These are readily differentiated, as their names indicate, by the fact that the thermoplastic compounds soften upon application of heat, whereas the thermosetting compounds (once cured) do not resoften under heat. From a structural aspect the thermoplastic compounds are composed of so-called two-dimensional molecules while the thermosetting compounds are formed of three-dimensional molecules. In general, therefore, it may be said that the thermosetting adhesives produce stronger and more durable bonds than do the thermoplastic adhesives, but that they are usually more expensive and require more complicated equipment. It is known that at a certain temperature—the softening point of the resin—the effectiveness of the bond is endangered. However, it is necessary that either high temperatures or chemical curing catalysts be employed with the thermosetting resins, and the catalyst or the heat may often cause decomposition of the material to be bonded.

Fillers for resinous adhesives

Many of the adhesives on the market include fillers such as woodflour, starch, walnut shell flour, etc. In some cases these fillers are used merely for extending the glue, but in many others they perform very useful functions. When a glue has a tendency to craze in the glue line, the life of the bond will depend on the rate of this process. The proper selection of a filler will retard deterioration greatly by terminating these cracks after they have progressed a very short distance. Inasmuch as crazing is frequently due to uneven expansion and contraction, the filler particles may serve to absorb these strains by themselves being compressed. A simple analogy to this function is the use of logs in swimming pools in the wintertime to prevent cracking of the concrete walls by expansion of ice. The logs absorb the expansion by being compressed.

In some cases it has been possible to offset wide variations in thermal expansion between the glue line and the bonded material by using a filler combination which matches the thermal properties of the particular material being used.

[3] See Footnote 1.

Adhesive materials

It must not be supposed that because so much has been said of the newer types of resinous adhesives there is no place for the earlier and better known products. On the contrary, some of these materials are holding their own through thick and thin. The purpose of this discussion is to point out the various types of adhesives available and to indicate their possible advantages or disadvantages in current applications. For the convenience of the reader, one authority's[4] arbitrary classification of adhesives in general is presented in the outline below and is followed by descriptions of some of the more important materials.

CLASSIFICATION OF ADHESIVES

- *I. Aqueous adhesives*
  - A. Inorganic
    - 1. Silicate of soda
      - a. Liquid
      - b. Solid (to be dissolved by the user)
      - c. Mixtures of silicate and clay
  - B. Organic
    - 1. Unstable
      - a. Animal glue
      - b. Soy proteins
      - c. Casein
      - d. Casein and lime mixtures
      - e. Adhesives which are treated with urea-formaldehyde
    - 2. Stable
      - a. Starch and starch combinations with gums, dextrines
      - b. Resin emulsions
- *II. Nonaqueous*
  - A. Cold
    - 1. Lacquer
    - 2. Pressure sensitive
  - B. Hot
    - 1. Adhesive waxes
      - a. Petroleum derivatives
        - (1) Paraffins
        - (2) Microcrystalline (often erroneously called "amorphous")
      - b. Petroleum waxes combined with various resins
    - 2. Asphalts
      - a. Hot asphalt or bitumen
      - b. Asphalt-wax mixtures
- *III. Asphalt emulsions*

Silicate of soda

Silicate of soda is compatible with other adhesives such as starch, dextrine, animal glue, natural rubber latex and many neutral dispersions of the newer resins. Its low cost (about the lowest of the adhesives) and its ability to stay on the surface of porous webs are distinct advantages. Brittleness, which may be an ad-

[4] J. D. Malcolmson, Technical Director, Robert Gair Co., Inc.

vantage for board work or paper-to-board or board-to-metal-foil, is a drawback with some laminations using thin flexible webs. A common application of silicate is in sealing box flaps. It is not practical for use, however, in automatic folding box packaging machines because of its tendency to dry to an almost insoluble crust.

It must be remembered that the silicate of soda is a strong alkali and a vesicant. It may have an unfavorable effect upon certain materials and inks. If a brand is used, however, in which the ratio of caustic soda to silicon oxide is not excessive, it will not discolor many papers and may even act as a corrosion inhibitor to aluminum foil. Extreme care should be taken in the glue room never to add acid agents to silicate of soda and always to mark containers plainly "Silicate Only".

Animal glue

Animal glue is characterized by distinct properties. It exhibits both mechanical and specific adhesion. The wide safety margin of animal glue indicates that reasonable care and accuracy in application (according to the manufacturer's directions) will result in glue-bonded packages of great strength. Among other desirable qualities of animal glue for packaging work are included high strength in joints, free-flowing consistency, freedom from foaming and crystallization on aging, miscibility and adaptability to a number of different use conditions.

Where nonwarp characteristics are desired, animal glues lend themselves to simple modification through the addition of suitable plasticizers such as glycerin, invert sugars or any of the various combinations of these.

Glycerin imparts permanent flexibility to the glue film, while invert sugars provide added length of tack and may be considered good glue modifiers for specific uses in paper box work. Flexible glues (produced from animal glues) are sold in the jellied state and possess reversible jell reactions. Because they will jell on cooling and melt on heating, it is quite possible to re-use them indefinitely.

The chief criticisms of animal glue have been its lack of waterproofness and relatively high cost. In addition, some types of animal glue—particularly fish glue—carry an undesirable odor which makes them unsuitable for certain purposes. Progress has been made toward the preparation of water-resistant animal glues. Of note are the wartime experiments, conducted by animal glue manufacturers in conjunction with independent research laboratories, which resulted in easily applied mixtures of glue, formalin and fungicides which provided highly effective moisture-resistant glue bonds for wooden military items of various kinds designed for tropical use.

Package manufacturers are constantly confronted with adhesive problems. The different types of packaging papers and boards vary considerably in absorption properties. Accordingly, the adhesive used must be adjusted to the particular job. The ease with which the ratio of animal glue, water and plasticizer can be adjusted and balanced to permit correct penetration into the paper stock, makes animal glue readily adaptable to varying machine speeds and different mill conditions.

Combinations of animal glue and urea are liquid at room temperature; can easily be used on nearly every type of glue applicator; and, when properly plasticized, will adhere not only to paper but to metal foils and a number of plastics. Animal glue is also extensively used in acid dispersions of plastic resins and with either natural or synthetic resins. Like casein, it is used as a dispersing medium for natural gum rubber or reclaimed rubber. Both of these adhesives may also be used to stabilize dispersions of wax.

Casein and soy bean glues

Casein and its new vegetable cousin, soy bean glue, are supreme among water glues. When dissolved with borax and/or aqua ammonia, both have good water resisting adhesion which is increased by adding a small amount of dilute ammoniacal formaldehyde. While this type of solution does not have much initial tack, it has great dry adhesion. Casein has greater water resistance and adhesive strength than soy bean glue, but it is also more expensive. For years it has been the leading carrier for clay and other paper coating materials as well as a pure food packaging laminant. Although a good adhesive for porous webs, it must have additives such as synthetic or natural rubber latex for the purpose of making it adhere to metals, glass or plastics.

The cost of a casein adhesive can be decreased and its usefulness as a water-resisting adhesive increased by mixing the casein with starch or silicate of soda. Care must be taken with silicate mixtures not to precipitate the silicate from the solution. Unlike many other water-soluble adhesives, casein, when once dry, stands next to the resin and rubber glues in water resistance. Casein-latex glue is a general all-purpose, all-machine adhesive.

Urea-formaldehyde and phenol-formaldehyde

Use of urea-formaldehyde and phenol-formaldehyde type glues, at present, in the packaging field has not been as extensive as their many good qualities warrant. They give a water and organic solvent resistance not achieved by other adhesives. They can be applied by all ordinary laminating machines and will set on the web in the drying operation. Once set, they resist water, oil, fats and most organic solvents. By adding catalytic agents such as ammonium chloride, their permanent set time or insolubility rate can be gauged to any predetermined time. However, these adhesives are expensive. Moreover, only one long experienced in the use of catalysts or setting agents should attempt laminations with these materials. These glues may be used in solution form on porous-to-

porous or on porous-to-nonporous surfaces. They can also be applied to hard nonporous surfaces like hard woods, glass or plastics, if applied and allowed to dry at normal temperatures, then laminated and set with pressure and heat.

A new combination of polyvinyl butyral with phenol-formaldehyde is of interest as a general utility thermosetting water- and oil-resistant glue. Its odor and toxicity at present prevent its use in food packaging. The chief use of this adhesive is as a metal-to-metal and metal-to-plastic adhesive.

Starch

Starches are among the lowest cost adhesives. While not very water resisting they can be made more so by adding materials such as urea,[5] formaldehyde, chromates and zinc chloride. Starch adhesion, normally only fair, increases as its viscosity decreases. While their resistance to water decreases as dextrination increases, their adhesion may increase. Acid reacting and neutral starches may be used to support dispersions of polyvinyl acetate.

On the other hand, only neutral or alkaline starches should be used as addition or thickening agents for natural or synthetic latex or silicate of soda. They are also compatible with casein and animal glue. Casein adds water resistance and strength; animal glue adds adhesive strength and quick set or tack to the basic starch adhesive.

Starch, pure or degraded by heat or by chemicals to varying percentages of dextrine, can only be used when one of the web materials is porous, such as paper or cloth. They are useless on most plastics unless other stronger and tackier materials are added. They make good laminants for paper-to-metal-foil combinations. It should be noted, however, that acid starches or starches containing soluble salts corrode aluminum. Only pure or neutral starch or starch mixtures should be used on aluminum foils. Lead foil is not so sensitive to chemical reactions.

In a great many cases where corrosion is not important or where the material will be used in a short time, acids such as sulfuric or phosphoric, when added in very small amounts to starch, give it a "bite" to aluminum foil, but unless the laminator fully knows what he is doing, this practice is to be discouraged. Resistance to mold can be increased by adding one half of one per cent of any of several mold inhibitors on the market.

From a machine or operational standpoint, starch and starch mixtures are ideal. They work well on smooth rubber or metal rolls and can also be accurately measured on the web with gravure or line metal applicator rolls. Care should be exercised to regulate the amount applied on the web in order to prevent lumpiness, streaks or wrinkles which may otherwise occur in handling starch adhesives.

[5] Various patents on the use of urea in its several forms prevent its indiscriminate and unlicensed use with many adhesives.

Resin Emulsions

While some resins can be dispersed in water without being first dissolved in organic solvents, the most approved method is to dissolve the resin or plastic with a minimum of solvent first, using the plasticizer as a solvent if possible. This heavy dispersion is then mixed with such materials as animal glue, casein, polyvinyl alcohol and a small amount of wetting agent such as morpholine or triethylamine, and a milky, aqueous, strong-setting adhesive results. Such compositions are good paper-to-paper and foil-to-plastic adhesives. By adding tackifiers and increasing the plasticizers and evaporating the water they are good "pressure-mounting-nonporous" surface adhesives. Aqueous dispersions are here to stay because they are versatile and can be applied on nearly all types of laminators. Care should be exercised to keep applicator rolls running so as not to permit the adhesive to dry on the rolls. Once dry, the glue is difficult to remove by any of the ordinary glue removing methods.

Nonaqueous lacquers (cold)

True resin solutions are those using organic solvents such as alcohol, naphtha, benzol, methyl ethyl ketone and the like. These are generally highly plasticized with abietates, dibutyl phthalate or tricresyl phosphate, according to the end use of the adhesive. Due to the presence of solvents, sufficient evaporation must occur before the residual tack permits the web to be pressure laminated.

Many materials are included among the nonaqueous, cold lacquers: plain rosin, poly-pale resin, ester gum, cumars, cellulose nitrate, ethyl cellulose, vinyls, styrene and polyethylene. As a rule, these materials carry their original characteristics into the finished products. Although these lacquers offer the advantages of quick-setting waterproof adhesives, they are usually expensive, due to the use of solvents. Moreover, these solvents frequently present highly dangerous fire hazards.

Dissolved resins and plastics, when used as tacky pressure sensitives, are of great use for laminating nonporous metal foils and plastics to each other or to machine-glazed and nonporous papers.

Wax

Adhesive waxes used in packaging are products of petroleum. Through different processes of derivation, two categories of petroleum waxes are available—paraffin waxes and microcrystalline waxes. The latter are sometimes erroneously referred to as amorphous waxes, for the determination of their crystalline structure has been relatively recent. While paraffin is less adhesive than microcrystalline wax, it is also less blocking. As such it is used in bread wraps, in sulfite tissues for pressure mounting to plastic films and to lead and aluminum foils. It has the advantage of being naturally

colorless (or white) and is less expensive than microcrystalline wax. The great value of microcrystalline wax lies in its adhesive properties and cohesive strength.

Due to their greatly increased use in war packaging, waxes are now available in colors, or with melting and penetration points that could not be had in prewar days. Especially have the microcrystalline waxes been improved. While most microcrystalline waxes melt within a range of 145 to 155 deg. F., with a penetration point of from 20 to 30, they can also be had from the softer microcrystalline oil-bearing petrolatums to the higher melting point tank bottom waxes.

The greatest improvement in waxes has been in their combinations with such resins as the terpenes, polypale resins and alkyds. The addition of polyisobutylene to wax adds tack, cold flexibility and adhesion. Wax-alkyd-resin combinations make excellent hot melts on foils-to-plastic and paper combinations. In cases where a microcrystalline wax alone has too much tack for a given purpose, varying amounts of white paraffin wax added to it will lessen the tack and also decrease the adhesion. A common practice is to prewax tissue with white paraffin and to laminate the tissue so treated to metal foils or plastics or to foil-plastic sheet combinations on a hot melt machine. Where the adhesive strength of the microcrystalline type is desired on a web later to be laminated to another web or to be used as a heat seal, blocking in the roll is prevented by dusting the exposed wax surface with starch.

Wax-soluble resin combinations will tolerate considerable amounts of tackifier like the cumars and/or toughening plastics like ethyl cellulose. The latter materials are not dissolved in the wax, they are merely held in suspension. The combinations may be applied with a spray or knife, but tend to "sludge" or settle out if they are applied on the continuously moving roll applicator.

Asphalts

The dispersion of petroleum and natural asphalts with the aid of hydrophilic colloids and/or surface active agents such as alcohol sulfates, and amines such as triethylamine or morpholine have yielded a new series of low cost nonpenetrating laminates which were used in making wartime V-board. The war measurably increased the use of nonbleeding asphalts as laminating mediums due to their availability, low cost, nontoxicity and ease of operation. Many of the lead-foil-paper combinations used in war packaging were adhered with specially treated asphaltic material.

The oxidizing of asphalts in their molten condition with the aid of blown steam and/or air makes what is known as "blown asphalt." The product is tougher, more flexible and resistant to cold flow and temperature changes than the untreated bitumen. Among the plasticizers that give fluidity and tack to petroleum asphalt and natural gilsonite are: rosin ester of ethylene glycol, hydrogen rosin methyl ester and the straight rosin methyl abietates. The pentaerythritol resin and resin esters add tack and toughness to asphalts as do also the vinsol ester gums. The hydrocarbon terpene resins are also compatible with asphalt. The addition of resins and petroleum waxes assists in the working of bitumens and also makes a more aqueous dispersible material. Wax lowers the melting point of the higher melting asphalts in addition to lowering their water-vapor transmission.

Miscellaneous

Zein—The alcohol soluble glue from corn starch should soon be made available. Inasmuch as it is soluble in water-alcohol solutions, is pure, nontoxic and almost odorless, it should be used to greater extent in the packaging field. It is a good paper-to-paper laminating adhesive and a fair heat seal.

Polyhydroxy alcohol—This is insoluble in cold water, but soluble in hot water and adds resistance to many other water-soluble glues. Almost at the top of the list in cost as well as in unusual properties is polyethylene. This water-clear resin is only soluble in hot xylol and is somewhat difficult to use. However, a material which, when laid in film form, has a four hundred per cent stretch at minus 60 deg. F. is worthy of consideration—especially since it is also nontoxic, odorless and heat sealing.

Amides and polyamides—The amide and polyamide resins are products of the war and should be given serious attention by all laminators. Due to the fact that they can be used as hot melts, thermoplastic coatings and heat seals as well as in solvent solutions, they are well on the way to becoming all-purpose adhesives.

Polyamide resins make good laminants to all types of webs and metallic foils and add water-vapor impermeability to paper laminations. When dissolved in their proper solvents and plasticized, they may be solvent laid as laminants or as plain or heat sealing coatings or lacquers. Polyamide-wax combinations give nonbleeding, flexible characteristics.

Silicones—A long hoped for addition to the supply of adhesives is found in the silicones. Thermosetting in nature, they have excellent moisture resistance and complete lack of carbonization on long exposure to temperatures as high as 250 deg. C. For short periods of time, silicone adhesives will stand even higher temperatures without deteriorating. Being electrically nonconductive, silicone adhesives may be used for electrical laminations without fear of fire or breakdowns. Their use as additive agents to other organic solvent adhesives and thermoplastics gives interesting and often unexpected results.

Chlorinated rubbers—Chlorinated rubbers may be applied in solvent phase or heavily plasticized and spread with a knife or a calender. Their thermoplastic makes them good heat sealers. When added to hot melt compositions they make the material tougher. The addition of rosin esters and hydrogenated rosin makes chlorinated rubber tackier. They are excellent for fire-resistant laminations.

Plus values and uses of adhesives

by A. B. Crowell

Although many of the recently developed adhesives are still too new to have had their potentialities entirely explored, nevertheless progress in this field has definitely established itself in numerous ways. Specific instances discussed in the following paragraphs should serve to demonstrate some of the outstanding achievements along these lines.

Paper containers

Liquid-tight containers—Special adhesives of synthetic origin have served to broaden the scope of the paper container to include the packaging of many types of liquid and wet products. Such adhesives are nontoxic, resistant to water (in some cases, to hot water), lactic acid and other chemicals. For more detailed information, see *Paper Containers*, p. 337.

Frozen foods field—Containers for this field have been developed along many different lines. Various cellulosic films, foils, etc., are employed. These films could not be utilized, nor could highly protective packages be developed if it were not for advances made in adhesives.

Cartons are the most widely used outer containers for packaging small units of frozen foods. For the best results they should be waxed. Heavy waxed coatings by the cold-water wax process are the most successful for all-around protection. In some containers, the wax should be sealed. Heretofore, containers have had to have certain areas dewaxed so that adhesives could penetrate properly to give good bonding properties. Developments are now taking place which will probably allow full utilization of the wax surface without dewaxing. In addition, these adhesives will remain flexible at low temperatures.

Paper containers as replacements for metal and wood—Through research, necessitated during the war emergency period, it has been found that some of the new types of paper container are improvements over the metal packages formerly used. A drawback in the adhesives first used in producing these substituted containers was that of slow production. Good bonding adhesives, however, were developed which actually speeded up the conversion of materials into satisfactory containers at reduced costs. These adhesives impart excellent rigidity to the materials they laminate, giving the container wall a tensile strength and bursting strength comparable to those offered by metal.

Early in World War II it became apparent that there would not be enough wood to use in the making of wooden crates and boxes for packing overseas shipments. Fibreboard and corrugated, as they were then known, would not qualify for such purposes. Better kraft papers were developed for containers and improved adhesives for use in combining these papers were also developed. The result was the now famous V-board container, which withstands drastic shipment and storage conditions.

Wet-strength papers

Base papers such as kraft and glassine are often treated with urea- or melamine-formaldehyde resins to produce wet strength. These papers are used in single wall or multiwall bags, carton and shipping container liners and for many other purposes for which they could not formerly be used if exposed to any degree of moisture. Ordinary dextrine adhesives, used in wet-strength paper applications, proved to be failures. Adhesives have been developed, however, in which the dextrines are treated with certain resin formulations making them suitable for producing satisfactory seals. These permit full advantage to be taken of the wet-strength quality of the paper in a wide range of applications. The modified dextrines are water resistant or waterproof.

Coatings

It is sometimes necessary to utilize an adhesive base for proper coating anchorage to paper or transparent film. The coatings often do not have the correct affinity for the base material, but the adhesive serves as an inner layer or combining medium between coating and base. This is particularly true of decorative papers and in some instances of functional papers.

Clay coating is an excellent example of why adhesives are necessary. Clay-coated boxboard and clay-coated papers used as wraps in the set-up paper box industry would not be of any value without a good binding medium in the coating, or as a sizing. Casein has been the basic material for the development of these coatings, but further improvements are now in process for giving a higher gloss or sheen to some of the clay-coating formulas, particularly for decorative purposes. In addition, the adhesive gives longer life to the paper, and abrasion resistance to the coating. In the overcoating of labels, some of the new adhesives not only render the bond of the label to its base waterproof, but also offer complete protection to the printing on the label. This is an asset in the labeling of drugs and pharmaceuticals which are around bathroom sinks, and offers added protection in the case of poisons where loss or mutilation of labels might cause serious accident.

Heat-sealing

This method of sealing is advancing rapidly but while the coating serves as a bonding agent, the use of such agents is somewhat confined to sealing similar coated

surfaces to themselves. Beyond these limits, adhesives must be called upon to reinforce the sealing strength of the thermoplastic coating. In other words, full use of thermoplastic coated papers, fabrics, etc., cannot always depend entirely upon the coating itself, and a broader scope of such finished materials is opened up by the utilization of certain adhesives in processing, converting, etc.

Lamination

Many new films have been developed which give improved types of package protection. Some of these films are of such light weight or thin gauge that reinforcement is necessary, and this is accomplished by backing with other film, paper or fabric. In such instances, special adhesives are necessary in order to give the strongest bonding for proper final strength so that the package may be 100 per cent perfect when it is in its finished stage.

Combinations of films, foils, fabrics and papers in different groupings depend on adhesives. New combinations of materials offer a wide scope in both decorative and functional packaging wraps and containers. For example, adhesives are available today which not only combine cellulose acetate to printed papers but impart a gloss to the combination which would otherwise be lacking. Wax and resin hot-melts are used to combine glassine or moistureproof cellophane material, each to itself.

In each of these laminations the body material does not offer enough protection from water vapor, and the adhesive carries part of the load. Paper and cloth can be combined to foil to provide tensile, tear and Mullen qualities sufficient to withstand rigorous storage and weather conditions. The adhesives used to combine these surfaces must be able to withstand the same conditions.

Greaseproof paper is often a lamination of one or more sheets of paper to cellulose acetate. During the war this sheet was required to resist the passage of viscous oily preservatives. It could not fall apart even under the most extreme immersion and temperature conditions. Above all it had to maintain a neutral pH, since it might come in contact with the packed object. The adhesive had to have the following qualities: It had to be able to combine cellulose acetate to paper. It could not give way under extreme temperature and moisture conditions. It had to be unaffected by all types of grease. It had to have a controlled pH. Such adhesives were developed.

Moisture barriers

Successful development of moistureproof barriers, so important during the war, was largely dependent upon the adhesive. New waterproof papers have been produced embodying the use of kraft paper and asphalt adhesives. Asphalt impregnations have also been employed. These papers have been extensively used as waterproof liners. All manner of creped and pleated types of such papers have been devised to provide adeaquate stretchability.

Adhesives were, therefore, developed to combine these surfaces and hold them under the most severe conditions, the liner being of prime importance from the water protection standpoint. In addition to asphalts, the most common types of adhesive used for this purpose are the resin emulsions and rubber-resin combinations. Many resin and resin-rubber types of adhesive thus developed proved to be actually stronger than the papers they were used to seal.

Palletizing

In palletizing regular fibre or corrugated shipping containers, a modified dextrine adhesive is used, one which will hold the containers in place without slipping, but at the same time will not cause tearing of the container liner when the containers are unloaded.

Air freight

During the war it was a common requirement of all services that where V-board cases were to be used, water-resistant adhesives also had to be employed. The larger packers of foodstuffs and the like had automatic equipment for sealing these cases. It was a difficult job to develop resin-emulsions which had the dry film qualities necessary for machine use. Automatic setups often called for the adhesive to be sufficiently set after thirty seconds' pressure to allow strapping of the cases. These adhesives should be useful in the sealing of cases for air freight where extreme moisture conditions occur as the plane gains altitude quickly after take-off. It is assumed that high altitudes will be used on long trips, and that the cockpit will be pressurized for comfort of the crew, but that the hold will not be pressurized because of the weight and cost factors involved. Much of the experience gained during the war in the development of adhesives should serve in the successful designing of strong, lightweight moistureproof packages to be used for air freight.

Conclusion

It is easy to see, from the foregoing paragraphs, that adhesives have been, and can be, developed to perform almost any unusual function. In fact, since 1930 it may be said that industries have actually been established because adhesives could be devised permitting full utilization of new ideas for new products. Adhesive manufacturers are aware of these industrial possibilities, and in most cases are prepared to "tailor" their adhesives to fit specifications. It is essential, therefore, that the adhesive supplier be thoroughly and accurately informed of the manufacturer's needs.

Additional specific details on this matter may be obtained from the article entitled *What the Adhesive User Should Know*, p. 565.

Equipment for applying adhesives

by D. V. Williamson

Industrial techniques for applying adhesives vary considerably. For successful results, however, application of the adhesive, in liquid form, must be made at the proper time and place. The type of adhesive to use and the method of application must both be given full consideration. Indeed, both of these factors must go hand in hand. In the building of new packaging equipment, the machine designer would be well advised to learn fully about adhesive possibilities.

A very detailed and definitive discussion of some of the methods for applying adhesives by the use of packaging equipment is given below.

Brushing

Hand brushing is a method of applying liquid adhesives which is so well known that it needs little comment. It is useful where packages are not of uniform shape and where production is limited.

The tendency in brush application is toward films which are too thick. Thin films are better. After receiving brush application of adhesive, boxes or cartons are frequently piled one on top of another to provide the pressure necessary for successful adhesion. However, suitable pressure units are available for this purpose.

The direct roller

On production machines, the brush method is superseded by other systems which are more versatile and efficient under continuous operation. Among these is the direct roller technique which is very widely used.

In direct roller application, the roller revolves partially submerged in the adhesive reservoir, and the adhesive is applied by the nonsubmerged portion of the roller directly to the surface to be glued. The thickness of film may be controlled by adjustment of the aperture between the roller and the adhesive reservoir, or it may be controlled with a doctor blade.

In general, cold liquid adhesives are used. By heating the glue pot, however, hot adhesives may also be applied by direct roller, as is the practice with case-sealing, tube-winding and folding-box machines.

The transfer roller

Here the adhesive is transferred from the partially submerged roller to another roller which in turn applies it to the surface to be glued. Sometimes the transfer traverses back and forth with a reciprocating motion, as is the case in some of the carton-sealing and bottle-labeling packaging operations.

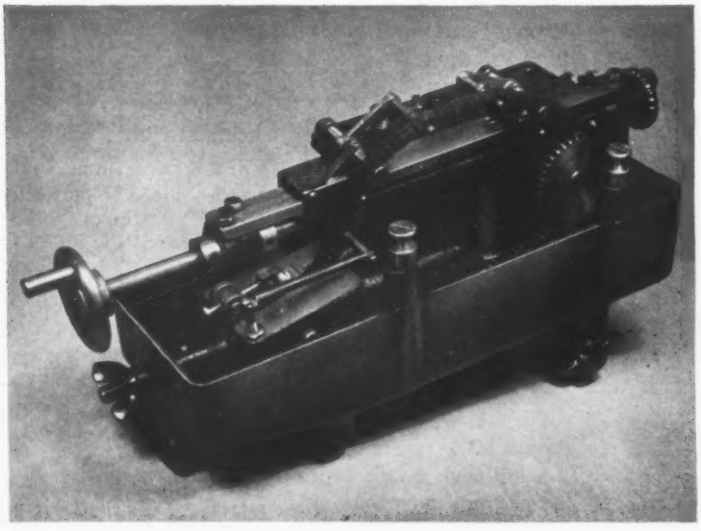
An adhesive, to perform properly under this method, must not string or cobweb under the reciprocating action, and it must not thicken too much from the rapid evaporative action of the transfer roller.

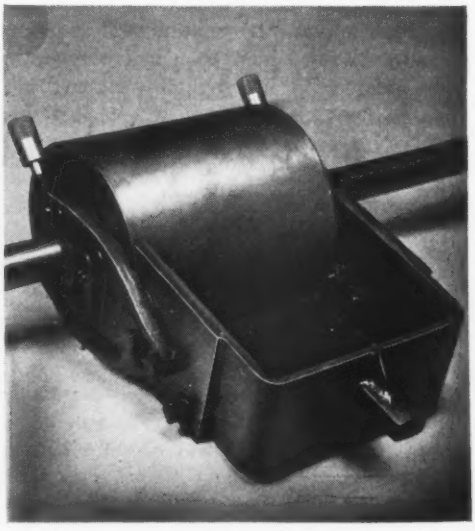
Stencil application

Adhesive is applied by a roller to stencils cut to the size and shape of the spots of adhesive to be applied. The stencils are on reciprocating arms which move back

1—(Left) Gum pot with adjustable chain. The chain picks up the proper quantity of adhesive for application to the container. 2—(Right) The glue pot, which is used for carton sealing operation, applies cold adhesive.

PHOTOS 1 AND 2, COURTESY STANDARD-KNAPP CORP.





and forth for fresh adhesive film which they deposit.

Some types of bottle-labeling equipment and Brightwood box-forming machines illustrate this system. To be satisfactory, adhesives must have heavy body, must be readily transferable without cobwebbing and must have great initial tack.

Belt transfer

In this method, the adhesive is transferred from an open glue pot by means of a rapidly moving endless belt which passes through the adhesive and then over and across the surface of the label. The most familiar example is the lap-label joint employed when using the cylindrical-can labeler.

For satisfactory results, the adhesive must flow readily while in heavy paste form, must cut off short and must maintain constant viscosity under the continuous agitation necessary for such operations.

Hot melt

With this type of application, the adhesive is fluid only when heated. Because of this, it sets up a thin film instantly upon touching a cold surface, and in this way rapid operation is permitted. The familiar example is the hot pick-up gum for cylindrical-can labeling.

Dipping

Some machines are designed so that a plunger dips under the surface of an open reservoir of liquid adhesive, picking up a small amount and subsequently depositing this at the proper location on the package. A very thin liquid adhesive is required which cuts off short. The dipping method, therefore, is suitable only for very light adhesive operations.

Gravity or pump feed

When packaging machinery is designed to feed the glue reservoirs with fresh adhesive by gravity or pump pipe-line feed, it is, of course, essential that the adhesive be of such viscosity that it will flow suitably.

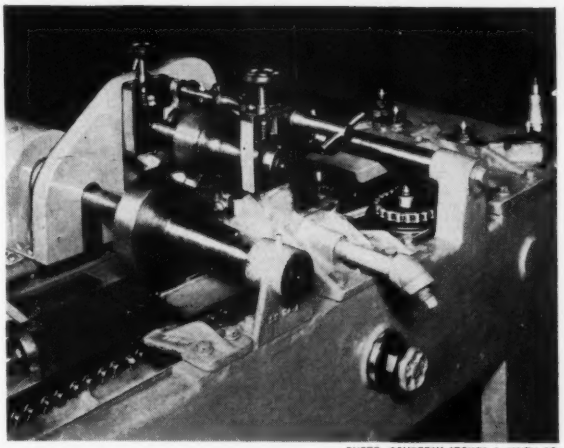
Capillary action

On some delicate operations, the thin liquid adhesive is brought up to the point of contact by capillary or wick action. An example of this is the application of solvent for the sealing of moistureproof cellophane in the packaging of cigarettes.

This method is suitable only in using liquid adhesives free of solid matter; otherwise, the pores in the wicks would clog up and fail to deliver.

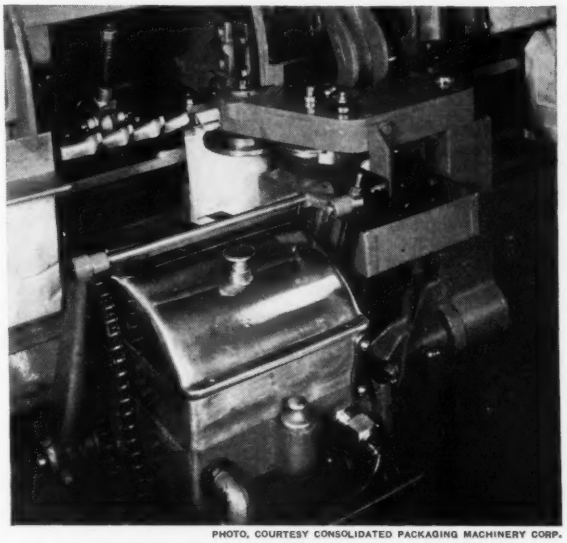
Remoistening

Remoistening is used with pregummed surfaces, such as those on bags, envelopes, gummed sealing tape and



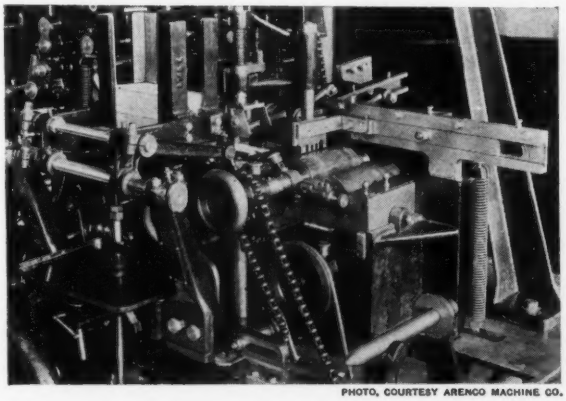
PHOTO, COURTESY STOKES & SMITH CO.

3—Detailed illustration of the gluing mechanism of a machine used for automatic sealing of envelopes.



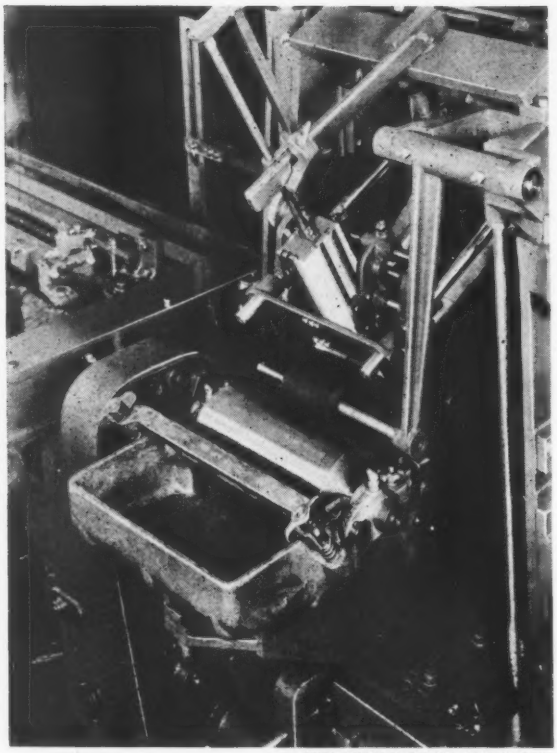
PHOTO, COURTESY CONSOLIDATED PACKAGING MACHINERY CORP.

4—This photograph features the glue applicator on a machine which forms, fills and seals bags that are used for packaging a number of dry products.



PHOTO, COURTESY ARENCO MACHINE CO.

5—Shown above is a mechanism by which labels are affixed, part of a machine for packaging cigarettes.



PHOTO, COURTESY ECONOMIC MACHINERY CO.

some types of bottle labeling. The gummed surfaces are moistened with water just prior to application. Gummed surfaces moistened with water do not, however, adhere as well to tin or metal as they do to some other materials.

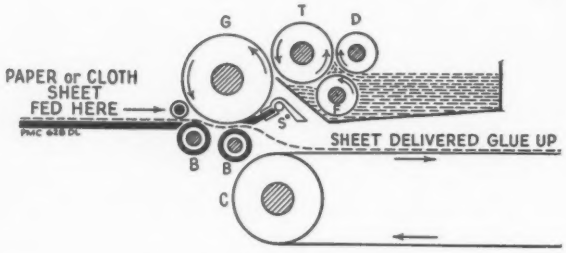
However, in this connection, it is interesting to note that a new type of remoistening gum, which is moistened with alcohol instead of with water, holds spot labels to tin or to metal with a bond which is both strong and permanent for all practical purposes.

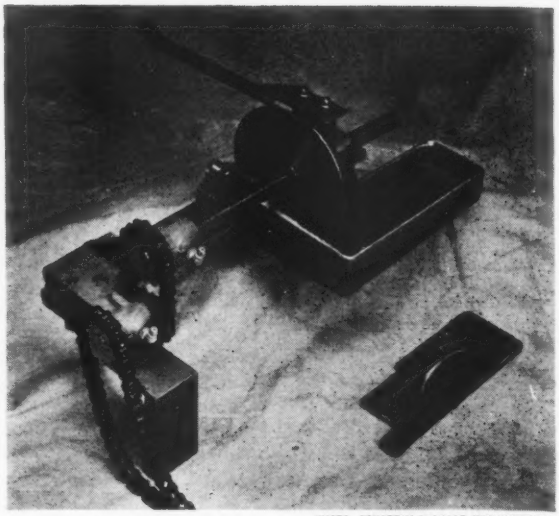
Thermoplastic adhesion

Thermoplastic adhesion is accomplished on surfaces which have been pregummed in the same fashion as ordinary gummed labels, but with a different type of adhesive. Adhesion is secured by the pressure of elec-

8—Schematic drawing. Dotted line shows course of paper and cloth sheets through a conveyor gluer.

DRAWING, COURTESY POTDEVIN MACHINE CO.





PHOTO, COURTESY PACKAGE MACHINERY CO.

6—(Left) Bottle-labeling machine, showing its adhesive-mechanism assembly. 7—(Above) This glue pot can be conveniently removed for daily cleaning.

trically heated plates at the point of contact. The heat instantly makes the thermoplastic adhesive liquid, and because of this factor it is possible to secure instant adhesion.

This method is useful for some types of bag and envelope closing, for laminating and for certain types of labeling. One distinct advantage is that the solvents in the original adhesive are not present in the dried film used. These solvents are frequently inflammable and of objectionable odor.

Spraying

This method is sometimes used to apply adhesives in locations and under conditions where no other method will operate. Spraying is successfully used, for example, to apply highly volatile and fast-acting adhesives in the sealing of filled bags of foodstuffs under conditions where no other method of application would serve to accomplish the desired result with the same degree of effectiveness.

Chemical attraction

In addition to the different methods of applying adhesives by packaging machinery, some other factors involved in the operations should be mentioned.

In any adhesive operation, the adhesive should be chemically attracted to both surfaces it must join together. If this does not occur, failure may result. This is an item of increasing importance as new finishes on paper, new plastics and new metal surfaces keep appearing in the packaging field.

This point is readily illustrated by the fact that adhesives which may be entirely suitable for securing labels to glass may fail in joining spot labels to tin cans.

The reason for this difference is that in the former case the adhesive is chemically attracted by the glass, while in the latter case it is repelled by the tin.

Factors governing adhesion

Given the proper adhesive and the correct method to do the job at hand, the three variable factors to be considered are pressure, time and heat.

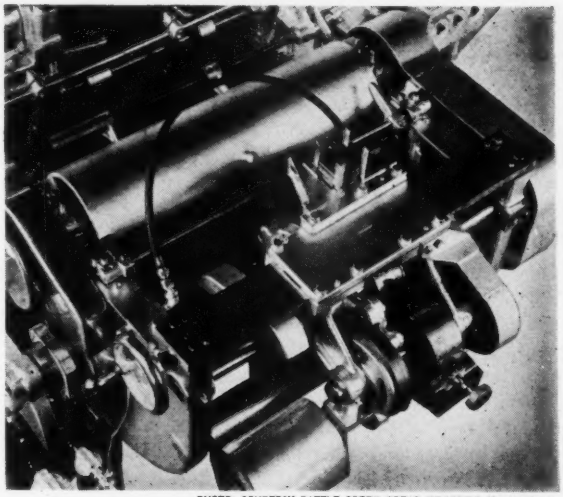
Pressure—Generally speaking, the greater the pressure the faster and better the adhesion. The pressure forces the adhesive into the pores and fibres of the label or paper or board. Of course, pressure must be kept in line—it cannot be so great as to crush a package. That brings up our next item, which is—time.

Time—If great pressure is not possible, then the package must be kept under pressure a sufficient length of time for satisfactory adhesion. Length of time under pressure does not retard production. It simply means longer pressure units.

The great majority of liquid adhesives used in packaging set up or take hold as the result of evaporation of water content. On dry winter days this action is much faster than is the case in moist, humid summer weather.

It is good insurance to design pressure units to meet the most undesirable weather conditions, and this precaution will result in much customer good will.

Heat—Most packaging-sealing operations are performed with cold liquid adhesives. This is the ideal type. However, in stubborn cases, or where time under pressure is very important, one or two steps may be taken to facilitate the operation by using heat. If the adhesive is suitable, the glue reservoir may be heated. This will frequently give faster penetration and, consequently, it will result in faster adhesive action.



PHOTO, COURTESY BATTLE CREEK BREAD WRAPPING MACHINE CO.

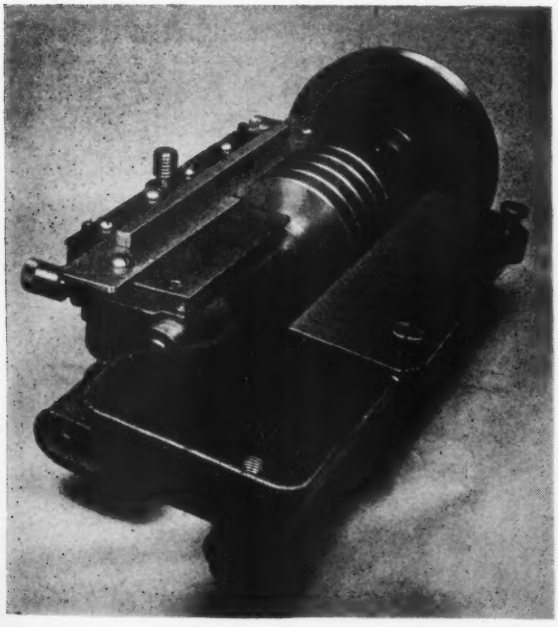
9—Machine for wrapping cake, depicting the glue receptacle, the transfer roll and the label magazine.

Electrically heated plates at the glued joint may be used with solvent type adhesives which could not be heated in the glue reservoir. Such plates are frequently used in sealing and labeling moistureproof cellophane.

Packaging machinery and adhesives are constantly being used with new and varied materials. In addition to this, there is always the demand for speed. A proper consideration of adhesives, therefore, is always necessary.

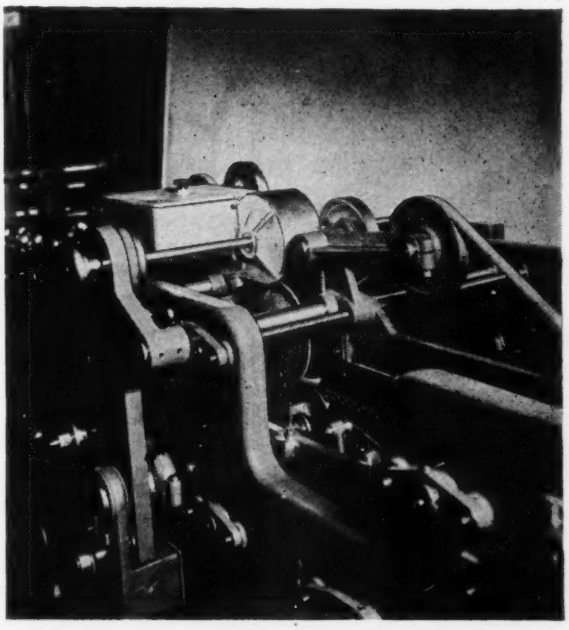
10—Labeling machine with roll-type gum pot has electrical heating element and thermostatic control.

PHOTO, COURTESY STANDARD-KNAPP CORP.



11—Mechanism for the application of glue, which is one step in the operation of a folding box machine.

PHOTO, COURTESY INTERNATIONAL PAPER BOX MACHINE CO.



Heat-sealing principles

by F. S. Leinbach

As a means of mechanical closure, heat sealing is simple and direct, and can be very sure. It can contribute tremendously to the functional abilities of packaging material because it is the link which completes the chain of protective qualities in a good package, closing the last entry or exit for water vapor, water, grease, contaminating aromas, etc. The actual package to be made more effective through heat-sealed closure may be chosen from many forms, as the marketing requirements, the shape, the size or the physical or chemical properties of the product dictate. Bags made from sheet or film with the entire surface capable of heat sealing or made with an imprint enabling heat seal on just the top and/or the bottom, packets made by sealing two sheets of film or paper together around their four edges, pouches made the same way or by folding a sheet back upon itself—these latter in sizes ranging from quite small to very large—liners placed in cartons either as pre-formed bags or as bags formed with heat seals right on the package-forming machine, wraps, plain, printed or transparent, with or without inner supporting carton—all these are forms of packages available through heat sealing. Machines ranging from the simplest inexpensive foot-power crimper to the most complicated automatic package forming, filling and sealing setup are available in a wide variety from reputable and very capable engineering firms. Materials ranging from the most ordinary waxed sulfite through the glassines and the lacquered or hot-melt coated papers; through the cellophanes with their heat-sealing coatings and the films that are entirely thermoplastic; the specially coated foils; and complex laminations of combinations of these materials with themselves or even more complex laminations of various of the materials so that each may lend its qualities to a combined job on packaging—all are available for heat-sealing work. Each requires its own terms of handling, though many are similar, and each reaches its best use only through cooperation between supplier and user in learning the optimum conditions under which the needed qualities are made most readily available.

1—Heat-sealed laminated glassine or wet-strength kraft bags are economical for frozen food packs.



The following definition of heat-sealing materials will be applicable in this discussion: heat-sealing materials are thermoplastic materials which can be formed into films or can be coated upon papers or other films and are reasonably normal, nonsticky solids at ordinary temperatures, but which either melt or become very sticky at temperatures ranging from about 150 to about 300 deg. F. If two surfaces of such a material are pressed against one another and if the area of their contact (interface) is raised to the temperature at which the material either melts or gets very sticky, the two surfaces will weld together (i.e., be sealed by heat). If the same material is coated over the surface of, for instance, paper, in sufficient thickness, two layers of that coated paper, if pressed together and heated, will be sealed by action of the heat-sealing coating.

Types of material

Heat-sealing materials are of two types: 1) those which are coated upon some carrier film or sheet and 2) those which can be made into films by themselves. Of course, some materials can operate in both categories.

Heat-sealing materials which are coated on carrier films or sheets, in turn, are of two types: a) those which truly melt and b) those which, on heating, become very sticky. This latter type generally is of materials which decompose before they get hot enough to melt.

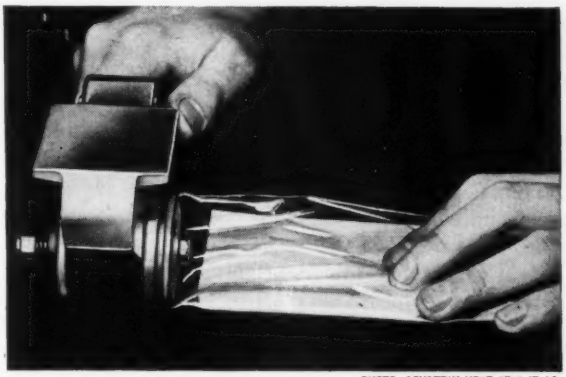
Paraffin wax is typical of the materials which are coated upon a film or sheet and which truly melt. Waxed paper, still the most widely used heat-sealing material, was the earliest product to bring the advantages of heat sealing to packaging. Paraffiin wax is not particularly sticky at ordinary temperatures, but melts at somewhat elevated temperatures, ranging from about 130 to 140 deg. F., depending upon the grade of wax used. If two pieces of waxed paper are pressed together and are sufficiently heated through to their interface, the paraffin on their surfaces will melt and fuse. While molten, the wax is not sticky, hence will not hold the two sheets together, but if they are held in position until the fused wax in the interface chills, the wax will

have sealed the two sheets together. It is characteristic of most true melting materials that their seals must be held in position while the sealing material solidifies.

The force required to separate the two pieces of sealed waxed paper, that is, the tightness of the seal, is easily seen to depend upon the cohesion of the wax with itself and the adhesion of the wax to the paper. It is common experience that neither the cohesion of paraffin nor its adhesion to paper is very great; therefore, the tightness of the seal, or the seal strength of waxed papers, is not very great, although obviously adequate for many purposes. It should be noted that within limits, the seal strength of waxed paper increases with an increase of the thickness of the waxed coating. It should also be noted that until a certain thickness of wax is coated on the surface of paper, it does not become heat sealing. If, under the heat of the seal, too much of the wax is absorbed into the paper or among its surface irregularities, too little remains on the surface to effect a seal.

In order to improve the seal strength of waxed papers, it is necessary to cause both the cohesion of the wax and its adhesion to the base sheet to be strengthened. This is done by adding materials like rubber, rubber derivatives or related compounds or resins. Suitable materials of these types not only raise the melting point of the wax, but also make it become quite sticky when hot. In fact, blends of this type do not have a true melting *point*, but, as the temperature increases, they become sticky (tacky) and softer until they finally do approach what might be termed a molten state, though never so fluid as molten wax. The relation between temperature increase and progressive softness is known as the melting or softening range of the blend.

As indicated, such blends can be made to be quite tacky when hot and thus make quick and firm heat seals with a mimimum of chilling required before the seal sets. In some cases, at sealing temperatures, the material of the coating is so tacky that no chill is required, for the tackiness of the material, though hot, is sufficient to hold the seal together. Blends of this type usually have excellent adhesion to many things, and papers or films coated with fairly heavy coatings have found widespread application, such as in bags for wet pack frozen foods, in cheese wrappers, and in heat-seal labels, where the tackiness of the hot material coated on the back of the label is useful in adhering the label to almost anything including glass, the sealed ends of waxed bread wrappers, individual frankfurters, etc. As may have been noted, such modification of wax tends to direct it into the second type of materials which are coated upon a carrier sheet or film, namely, those which on heating do not melt, but become very sticky. Most widespread among these latter materials are cellulose nitrate lacquers. Cellulose nitrate, by itself, is anything but heat sealing, but it does form cohesive coatings. Adhesion between the cellulose nitrate and the carrier film or sheet is obtained through the addition of resins, which have, as a class, excellent adhesion. This blend is then softened with a plasticizer to a point where the softening range is such that the coating is not sticky at ordinary temperatures, but becomes so tacky at elevated temperatures that fusion may be accomplished. Here, as with the paraffin or modified paraffin, the seal strength remains a function both of the cohesion of the coating and its adhesion to the base material. It is difficult to find that rare blend of cellulose nitrate, resin and plasticizer which has the proper softening range; and the lacquer formulator is ever harassed by the possibility of the coated material sealing to itself in rolls before use (blocking), or of not becoming sufficiently tacky at permissible temperatures to seal effectively. For these and other reasons, *all* heat-sealing packaging materials should be stored at moderate temperatures by the user.



PHOTO, COURTESY HEAT SEAL-IT CO.

2—Constructed of aluminum, this new iron rolls a perfect 1/8-in. permanent weld in quick time.

Cellulose nitrate heat-sealing coating is to be found extensively in heat-sealing cellophane. As is commonly known, this product is made by applying a nicely blended heat-sealing coating, based on cellulose nitrate, to a film of regenerated cellulose.

There are a number of other materials which adapt themselves to heat-sealing coatings. Ethyl cellulose and its blends make coatings which heat seal excellently. Cyclized rubber coatings have a quick, firm heat seal. Cellulose acetate can be formulated for heat sealing. The vinyl polymers produce coatings which heat seal at fairly low temperatures. Vinylidene chloride polymer, the mixed cellulose ethers, polyvinyl butyral and polyethylene, all produce excellent seals. These materials vary in their cohesion and in their adhesion to base materials; therefore, the strength of the seals they make will vary.

Many heat-sealing materials are cohesive and strong enough to be cast into films, thus obviating the need for a backing or carrier. In many cases, however, these film-forming materials can also be used as coatings if desirable. A well-known example of heat-sealing material which may be used either as a coating or as an unsupported film is rubber hydrochloride. This material has been extensively used for packaging large pieces of machinery or engines and has been successful in preventing corrosion. Ethyl cellulose and cellulose acetate, cast into films, have found wide use in packaging, especially where greaseproofness is required. The thermoplastic properties of ethyl cellulose, which give it heat-

sealing qualities, also permit its use as a successful dip coating for corrosion prevention in packaging metal products. Recently developed formulations of vinyl chloride and vinylidene chloride are successfully applied as spray coatings, forming a strong self-sealing protective film over the product to be packaged.

Thin, flexible sheets of polyethylene which are waterproof and capable of retaining their flexibility over a wide range of temperatures have been used in Great Britain to package tablets of the anti-malarial drug, mepacrine. By means of especially adapted machinery, the tablets are sealed in individual pockets of polyethylene ribbon 0.004 in. in thickness. Tests are reported indicating that the package is unaffected by tropical heat and provides protection for its contents even after months of exposure to salt water.

Methods of application

Heat-sealing materials are directed to packaging use in four general methods: 1) as a self-supporting film, 2) as an over-all coating on a carrier sheet or film, 3) applied as a spot or strip only to those areas of a sheet or film that are the areas to be heat sealed in forming or closing the package (as around the mouth of a bag) and 4) applied to the areas to be heat sealed, just as the package is in the process of formation.

In the case of the self-supporting film, the strength of the properly made seal is the strength of the material itself. A package made from a heat-seal film and having completely heat-sealed closure is literally encased in a continuous unbroken film of that material. The advantages of such an arrangement in terms of water-vapor-proofness or the other functional qualities of the film are altogether obvious.

In the case of the over-all coating, the same situation may be closely approached, even approximated with ideal seals, although the full functional efficiency of packages made from coated sheets or films is more likely to be impaired by less than perfect seals.

In both cases, however, considerable advantage in package formation accrues from the fact that any two areas of the films or coated papers, when placed in contact and heated, will form a seal. No regard need be paid to having exactly the right spot in the right position. These methods of directing heat-sealing agents into packaging work are the most widespread aud enable the formation of wraps, bags, packages and package adjuncts of varied types and description.

Heat-sealing materials directed to packaging use through applying a spot or strip only to those areas to be heat sealed are finding increasing use, particularly in bag manufacture. Many materials that have most useful qualities, such as the greaseproofness of parchment, and both the water-vaporproofness and greaseproofness of laminated glassine, do not happen to have the ability to heat seal. They can be augmented with a coating to lend heat sealing characteristics, but if the coating does not have to contribute some other useful function, it is not an economical measure since the majority of the area covered by the coating is not involved in performing the heat-sealing function. In bag manufacture this problem is solved by applying an imprint of heat-sealing material around the inside edge of the top of the bag, because this is the only area that needs to be in contact for heat-seal closure. In some applications of foils, a thermoplastic material is spotted in strips along only those areas of the web which contact when the seal is made.

The direction of the heat-sealing materials into packaging use by applying them to the areas to be sealed, but applying them as the package is in the process of formation, is peculiar to certain types of wrapping equipment which enables the advantages of heat sealing to be used on nonheat-sealing webs, just as in the previous method. In this case, however, the web is fed into the wrapping machine and, as it is placed around the object to be wrapped just before the areas to be sealed are brought into final contact, strips of heat-sealing (thermoplastic) material are placed on the proper areas, the closure is made and the seal ensured by heating.

The effectiveness with which two or more layers of a particular heat-sealing material may be sealed together depends upon three factors: 1) the temperature applied, 2) the time during which the hot contact is maintained, 3) pressure with which the layers are held in contact. Each factor varies in relation to the other two.

The temperature factor

A heat-sealable material is heat sealing because there is some temperature at which it either melts or becomes fusible. The factor of temperature in heat sealing, therefore, is determined by the temperature at which fusion of the particular material can be accomplished, but it should be noted that if an agent fuses at 200 deg.F. the sealing mechanism furnishing the heat may have to be much hotter than that, for it must drive enough heat through the intervening layers of sheet or film to raise the two surfaces in contact to the fusing temperature. How much hotter the sealing mechanism must be depends entirely upon the pressure with which the contact is maintained and particularly upon the time allowed for the heat to transfer. Furthermore, surface temperature of the sealing mechanism is only an indicator—the amount of heat its heater can furnish is the real determining element, because it must have sufficient capacity (wattage, in the case of electric heaters) to transfer heat enough to make seal after seal and still maintain the temperature differential required to cause the heat transfer capable of raising the inner surfaces to their fusing temperature. For the surface of a sealer to be quite hot at the start of a run is of no particular value. The heater must be strong enough to keep it up to the proper temperature throughout the run.

The time factor

Time is a very important factor in heat-sealing technique and is closely related to temperature. At any given temperature and pressure, enough time must

elapse for sufficient heat to penetrate the intervening layers and cause fusion of the sealing surfaces. Increased temperature (properly caused by sufficient heat supply) and increased pressure will require less time. Thus, of the three basic factors in heat-sealing techniques—temperature-time-pressure—none of these factors operates independently, for each is closely related to the other. Regarding this temperature-time-pressure relationship, it is also important to note that there are limits affecting each of the three factors and their interrelationship. If the heat supply is increased, at a given pressure, the time can be decreased, but this relationship reaches a limit in two ways. The first limit occurs when the time is so short that the sealing mechanism must become so hot that it burns the outer plies of the seal, without raising the inner sealing surfaces to the sealing temperature. This is one reason why certain materials are found to have a limit of operating speed regardless of heat supply in the sealing mechanism, for as the speed of sealing of the mechanism is increased, the time factor is decreased to a point at which the above-mentioned difficulty is encountered. This is fairly common and is most easily noted on fibrous base materials. This situation can be alleviated if the sealing or wrapping mechanism is equipped to apply to the sealing areas small amounts of a solvent which will partially dissolve or soften the heat-sealing agent. Under that heat which does reach the fusing surfaces, this solvent softens the coatings, enables them to fuse and then evaporates under whatever heat is there at that time or during subsequent time. Such aids to sealing are known as solvent activators and their composition must vary according to the composition of the heat-sealing materials they activate, for they must be of a type capable of dissolving that particular coating. They are so effective that the widest use is in enabling heat seal of materials that ordinarily are not heat sealing, such as the type of cellophane usually employed in the wrapping of cigarette packages.

The second limit on the time portion of the temperature-time-pressure relationship is the strength of the heat supply. It is most important to realize that the surface temperature of sealers at the start of a run means little. There must be sufficient heat supply to keep furnishing heat to seal after seal without cooling below the supposed or apparent surface temperature. One fallacy of inexperienced operators is to suppose that because a thermostat on the sealers of a high-speed machine has a marking for 500 deg. F., the mere setting of the device at that figure guarantees that temperature. Under some such instances it has been found that the current merely is allowed to flow all the time, that the heater is not strong enough during the run to hold the temperature above an actual 275–325 deg. F. and that, as a result, the thermostat never gets a chance to control the temperature. Obviously, for effective operation under this condition the time factor must be adjusted (machine slowed down) until it balances the heat-furnishing ability of the sealing mechanism which is being used for that particular job.

Temperature range for heat sealing

Every heat-sealing material has an optimum sealing range of temperature below which inadequate seals are obtained and above which the seal is not so tight as it could be made. This sets a limit upon the temperature portion of the temperature-time-pressure relationship. The effect of a solvent activator, used under difficult circumstances, is to broaden the optimum sealing temperature range of heat-sealing materials. A further limit becomes apparent when it is realized that if the outer plies or outer portions of plies adjacent to sealing surfaces are made so hot that they remain above the sealing or fusing temperature of the heat-sealing agent, that agent remains soft, the seal is not self-supporting and it comes open. Some materials that actually melt, such as paraffin wax, and others which fuse at similarly low temperatures, always require definite chill, or cooling while the component plies of the seal are held in place. An example of this is found in the take-away belts on a bread wrapping machine handling waxed paper. Without the chance to solidify in position, the seals would all come open. Materials that fuse at a higher temperature, such as heat-sealing cellophane, do not need that type of chill, but they must not be made so hot that their heat cannot quickly transfer to surrounding areas or the seal will be less effective. Self-supporting, heat-sealing films, such as rubber hydrochloride, should not be made too hot, for the material will be pressed out too thin and what otherwise would be a weld of the entire material as strong as the film becomes the weak point.

The limitations on the pressure portion of the temperature-pressure-time relationship are mainly mechanical.

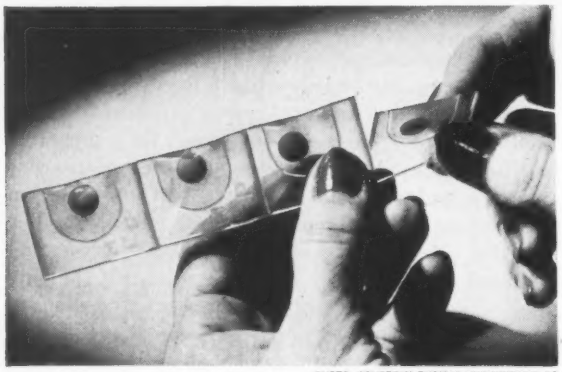
The handling of the temperature-time-pressure relationship is a technique which must be worked out in practice with a given heat-sealing material on a given sealing machine and given job. Big packages, run at high speed, take more heat away from the sealers and require more heat than smaller ones require running at lower speed.

For each seal, regardless of how rapid the successive rate of making the seals, enough heat must be trans-

3—Thermoplastic band at the open mouth of laminated bag permits heat sealing tobacco package.

PHOTO, COURTESY E. S. & A. ROBINSON LTD.





PHOTO, COURTESY THOMAS ENGINEERING CO.

4—Polyethylene film, folded and heat sealed, packages mepacrine for Chemical Industries Ltd.

ferred from the sealing mechanism through the packaging material to the inner sealing surfaces to raise the sealing agent to its fusing temperature. Temperatures that are initially high are meaningless. The heat supply must be sufficient to maintain the higher sealing temperature which will ensure this flow of heat through to the inner sealing surfaces of each successive package as the seals are made throughout the run. The temperature-pressure-time relationship is not hard to establish, however, particularly if the supplier, who understands his material, and the user, who understands the job can cooperate.

The pressure factor

Pressure of contact is important because under close contact the heat will transfer more uniformly, more thoroughly, more quickly, because the seal will be stronger with every point of the sealing area in close contact rather than apart in spots and because the temperature at which most heat-sealable materials will fuse generally decreases, within limits, with an increase of pressure. As is well known, some of the softer heat-sealing agents will seal at ordinary temperatures under sufficient pressure. Increased pressure, therefore, aids the ease, strength and thoroughness of a seal unless some extraneous factor, such as rupture of the carrier film, for example, is unexpectedly introduced.

Mechanical principles involved

The mechanics of causing heat seal generally are effected through contact between the material to be sealed and a close-pressing, heated area of metal. Translated into moving machinery, this is accomplished through three types of movement—reciprocal, rotary or sliding.

The simplest form is reciprocal motion and it is exemplified in the common crimp sealer, wherein two heated metal plates are brought together, pressing the areas to be sealed between them. The simplest are manually operated, with time and pressure, and sometimes temperature, left to the experienced judgment of the operator. These are improved with thermostatic heat control and in some machines complete control is given for the whole temperature-time-pressure relationship by thermostatic control of temperature and by actuating the sealing jaws with an electric motor through a drive having adjustments to control pressure and time. Various types of configuration of the sealer surfaces are used by the different manufacturers. Some form of surface configuration usually is desirable, enables a tighter seal and minimizes the slight mechanical difference so sure to occur through the warping of any metal part that is continually kept hot. Surface configuration thus minimizes occurrence of areas of too light pressure between partial areas of the sealer surfaces.

Reciprocal sealing motion is being used increasingly in wrapper and package forming equipment. Certain machines placing liners in cartons make ingenious use of reciprocally moving sealers which travel with the liner-forming device. Reciprocal motion also is used in various types of machine, making bags which have all seams and seals heat sealed and is not only advantageous, but is one of the two forms of sealing motion to which certain heat-sealing agents are limited.

Rotary motion, as the term implies, effects a heat seal by having the layers to be sealed pass beneath a heated roller or between two heated rollers. Here the time factor of the temperature-time-pressure relationship has great effect upon the temperature factor, for the effective sealer area is only the line of tangency (actually a small area) between the surface of the wheel and the plane supporting the material to be sealed or between the two sealing wheels. If the material to be sealed moves by quickly, the time allowed for heat transfer becomes very short. This situation is sometimes assisted through the use of preheaters which warm the areas to be sealed prior to their entering the sealer contact. Solvent activators find only limited use and then only under favorable conditions, with this type of motion. If they don't actually and obviously help, they are worse than if not used at all. This is because under this type of motion the outside of the webs to be sealed sometimes tend to adhere to the wheel. Thus, the seal, soft under the influence of the activator, is pulled apart as fast as it is made and never gets a chance to set up in position. This has been relieved through the use of pressure belts that hold the seal together throughout all the phases of the operation. Actually, this type of seal failure sometimes occurs without the presence of an activator if the material to be sealed has as strong a tendency to adhere to the wheel as it has to cohere with itself. Examples of this are found, under certain conditions, in some papers having both sides lacquered and in some machine operations (rather than hand operations) with rubber hydrochloride film. In the case of materials suffering these difficulties, it is not to be assumed that the machine is a failure nor that the material is inadequate. Rather, the functional qualities or the economy of the heat-sealing material or the special advantages of the equipment should be considered.

Sliding motion is the most widely used method of heat sealing, being characteristic of almost every wrapping

machine that uses heat seal for closure. In the case of the wrapping machine it is obvious, from a simple analysis of the wrap formation, that in order to seal all avenues of entry to or from the package, the wrap must be heat sealing on both its surfaces. This means that heat-sealing material will come into contact with the sealing plates along which the wrap slides as the seal is made. Since a fusible material on being heated first becomes tacky, then reaches its fusing point, there is a tendency for some heat-sealing materials to stick to the sealing plates when there is insufficient heat supply to maintain the proper sealer temperature. There also are certain materials, such as the coatings and films derived from rubber, which cannot seal with a sliding motion.

Such coatings, even up to the point of decomposition, remain so tacky that they will stick to the sealer so tightly that the wrap, after a very few packages are run, is torn from the package. The case of the rubber-derivative film is much the same. Again, neither material nor equipment is to be condemned.

If there is too little heat supply and a two-side coated lacquered material begins to stick to the sealers, it generally is a simple matter to increase the heat supply.

Many such cases have been remedied when operators realize the fact that, as mentioned above, many heat-sealing agents, while being heated, first become tacky, then actually fuse. It is during this insufficiently heated tacky stage that adhesion to the sealing plates most seriously occurs. If the material is one of those that simply will not seal with a sliding motion, its functional advantage or its economy should be weighed in the light of cost of getting new equipment or adapting old equipment to the proper type of sealing motion.

With this type of motion, as with the other types discussed, the temperature-time-pressure relationship is paramount and the temperature must be considered as a problem of heat supply and as a rate of heat transfer within the time available for that transfer.

Much work has been done on the kind of material to be used for the sealers. Copper has been found desirable because its thermal conductivity allows more uniform heat distribution over its entire area and because it resists chemical reaction with the resins used in heat-sealing materials which often have a high acid number. Brass, easily formed into parts, is widely used and has good thermal conductivity, although it is not so resistant to corrosion as copper. Stainless steel has been widely and effectively used and has given long, satisfactory service. Cast iron is proposed by some engineers, but has not found widespread application, probably due to its sometimes porous structure and lower thermal conductivity.

Suggestions for testing methods

Even for elementary inspection and evaluation of any heat-sealing material, it is necessary to know the temperature required to effect a seal with that particular material, the strength of its seal, and whether or not the material is likely to block (stick together) during shipment prior to its use. It should be noted that the temperature required to effect a seal with a given material is not the same as the temperature of sealers on the machines handling the material. (See p. 730.)

The fusing temperature of any heat-sealing agent varies with the formulation of the material itself and must be determined for each material and for any variation of it. A method for such determination has been to press two thicknesses of the material together between two heated metallic sealer surfaces with sufficient pressure to ensure close and uniformly even contact, inspecting the tightness of the seal at progressively increased temperatures. For almost all materials an optimum temperature range will be found, below which or above which the seal is not as required.

The material of the sealer surfaces should be nonreactive to materials such as resins having high acid numbers and it should have good thermal conductivity. Copper suggests itself from both standpoints. An electrical source for heat usually is best, and should be of such shape and position as to ensure even heat distribution across the sealer surface. The temperature might be measured by a surface pyrometer actually placed against the sealer surfaces, but maintained by close thermostatic control, in which case the thermostat bulb should be between the source of heat supply and the sealer surface. It may be possible to do this job through accurately calibrated thermostatic control alone. The sealing surfaces probably should be flat, since the same apparatus is essential to the ensuing test, and serrations might cause an uncontrollable variable in that test. The trouble with this, however, is that metal parts, however carefully manufactured, tend to warp even slightly under prolonged heating, and even slight variation of pressure alters the effectiveness of the seal. It is probable, therefore, that one of the sealer surfaces should be a heat-resistant resilient material, possibly one of the vulcanized synthetic rubber compounds. This suggests one sealer surface or block made of metal and containing the heat source, the other made of a resilient material, without a heat source. The force applied to make the seal should be sufficient to ensure close contact throughout the sealed area. The time of contact should be long enough so that the entire sample is raised to the indicated temperatures.

It must be remembered that in the case of coated materials there are many combinations where the seal is stronger than the base material, resulting in a "tear" seal, meaning that on separation of the seal the base material tears without causing the seal to fail. Thus a strong sealing coating on a weak base material can give a tear seal, but on a stronger base material it may not cause a tear seal.

It is the opinion of the writer, though this is not necessarily shared by various well-informed workers, that in any standardized seal strength test some means of correlating such performances must be worked out. It has been suggested, and it may be shown to be adequate, that in the case of the tear seal one should report the force which had to be exerted.

Adhesives for heat sealing

by Randolph R. Wiggins

Although in a number of instances heat-sealing adhesives provide protective coatings when applied all over the surface of a base stock, this is by no means always the case. A major function of the heat-sealing adhesive is the part it plays in the fabricating and closing of flexible packages, for which purposes protective qualities are not required. This discussion will be confined to the heat-sealing aspects of various thermoplastic adhesives.

For heat-sealing purposes, the truly ideal adhesive should embody the following characteristics. It must be compatible with the surface to which it is applied. In the case of the hot melt or molten type, it should be capable of application at a moderately low temperature because of the dehydrating effect of heat on paper and films and, to a lesser extent, the destructive effect of continued elevated temperatures on the machine used in the application. In the case of the liquid adhesives, which include both solvent and emulsion types, a high solids content and a low viscosity allow a maximum of material to be applied with a minimum of drying. After the adhesive is applied it should be nonblocking and of course nontoxic in all cases where it is used on the interior of a food package. Finally, since one of the chief reasons for the increasing use of thermoplastics is the gain in production over the older pasting methods, the application of the heat-sealing compound should not slow up the printing press or fabricating machine when it is made in conjunction with these latter operations. Of the three general types of heat-sealing adhesives—emulsion, hot melt, and solvent or lacquer—each has applications for which it is especially adapted.

A variety of active ingredients may go into these, including such materials as straight paraffin wax of the type used for heat sealing ordinary bread wrappers, microcrystalline waxes, vinyl polymers, acrylic resins, rubber derivatives such as Pliolite and chlorinated rubber, polyethylene, cellulose derivatives (ethers and esters), alkyd resins, polyamides, and dextrin-resin and zein-resin combinations.

In the case of heat-sealing emulsions the possible selection of raw materials is wide. The factors governing the choice include compatibility with the material to be sealed, final plasticity desired and ease of emulsification. The chief drawback in the case of emulsions is that they are often slightly tacky when dry inasmuch as it is extremely difficult to drive out the last traces of water from the applied film of adhesive, and blocking is likely to occur in stock which is wound in rolls, or in cartons of finished units packed tightly together for subsequent heat sealing. The water in emulsion-type thermoplastics often causes a certain amount of wrinkling on paper and nonmoistureproof cellulose film which may be objectionable in appearance.

Hot-melt thermoplastics may be formulated utilizing practically all the materials listed above. The factors influencing the choice of raw materials for this type of adhesive are melting point, desired viscosity and, to a lesser extent, cost, where this type of heat-sealing adhesive is used for the high-speed production and sealing of cheap packages. The viscosity depends upon the type of machine used for application and the stock to which the adhesive will be applied. Blocking difficulties are, as a rule, not encountered with hot-melt adhesives since the addition of cellulose derivatives and waxes usually overcomes this tendency.

One of the most important factors to be considered in the case of hot-melt adhesive is that special machinery is necessary for application. This machinery is expensive compared with that used for the application of solvent and emulsion adhesives, since it must be especially designed for particular jobs, and its life is short because of the detrimental effects of the high temperatures at which it must necessarily operate.

In spite of the advantages of the newer hot-melt and emulsion types of thermoplastic, the solvent or lacquer type still affords the greatest latitude for formulation to obtain adhesives for special jobs. The various cellulose derivatives can be employed in such lacquers for their film-forming and antiblocking properties. Since practically every thermoplastic resin can be incorporated in a lacquer-type adhesive, cheap adhesives of this type can be formulated which, when used in relatively small amounts, do a better and cheaper job than glues and pastes.

An important factor in using heat-sealing adhesives in place of glues and pastes is a complete understanding of the process involved. After the adhesive has been applied and dried, or set, in the case of hot melts, for subsequent heat sealing, the thermoplastic must be reactivated under the influence of both heat and pressure at the time when the seal is to be made. Pressure must be continued after the application of heat until the seal has cooled somewhat. The seal sets as soon as the temperature has dropped a few degrees below the minimum temperature necessary for sealing and the pressure must not be removed before this has taken place.

One of the problems encountered with the use of thermoplastics in the case of laminated stocks is that of delamination. This is especially noticeable in the case of laminations including heavy paper stocks. This phenomenon is due to both the low heat transfer rate of heavy papers and low melting points of the usual laminating agents which often contain a high percentage of waxes. The solution of this problem lies in decreasing the sealing temperature to a minimum and increasing both the time and pressure factors to compensate for it.

What the adhesive user should know

by G. B. Cloran

In this discussion the term "adhesive" covers glues, gums, pastes and the like, in all of their commercial forms, unless individually specified. Recommendations for handling, preparation and use of these products are intended as a general guide and are subject to any special instructions furnished by the manufacturer.

Correct procedures are neither difficult nor complicated. Once the packager is familiar with the basic rules applying to the particular types of adhesive he uses, the practical simplicity of proper handling will be obvious.

In all events, it is wise to prepare small test batches of any new adhesive being adopted so that in case of error or unsatisfactory results, the supplier may be consulted before a significant loss has been incurred. The supplier should also be consulted in advance of any changes in specifications, such as changes in stock or in application method, because these influence the selection and use of adhesives.

When to order adhesives

Although most liquid formulas are very stable and it is safe to store them for much longer periods of time, requirements should not, as a general practice, be anticipated by more than three months. The majority of prepared adhesives are organic and subject to change on prolonged aging. It is usually better, therefore, to order small lots—even at slightly higher unit prices if necessary—than to risk stocking too far ahead.

This rule, however, does not apply to adhesive products supplied in dry form, providing they are properly stored. Nor does it necessarily apply to adhesives used in areas which experience low winter temperatures. The practice under these latter conditions is to order a four months' supply to be shipped early in November. However, if any changes in job specifications are foreseen, it is wiser to order normal supplies and to rely on deliveries as needed, using heated carriers to avoid freezing of the adhesives in transit.

How to order adhesives

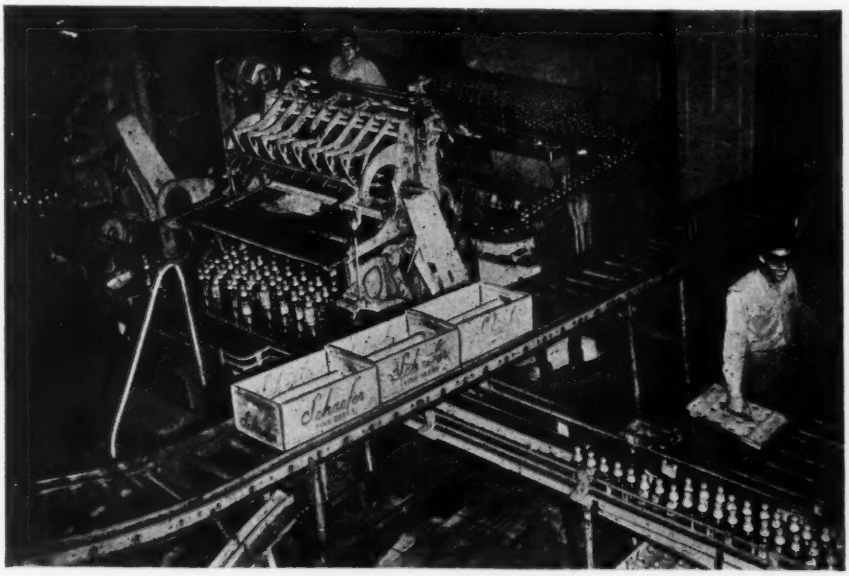
If the adhesive supplier is not immediately available when a new adhesive requirement presents itself, detailed specifications should be submitted to the manufacturer. Samples of the surfaces involved in the adhesive operation should be sent as well as samples of the adhesive currently used. Conventional data sheets are usually available which may be conveniently filled in with pertinent facts. In the absence of such a form, however, the following information should be adequately supplied—as applicable.

Adhesive currently used—In addition to sending the samples of this adhesive, any suggestions for improving the product should be submitted to the manufacturer.

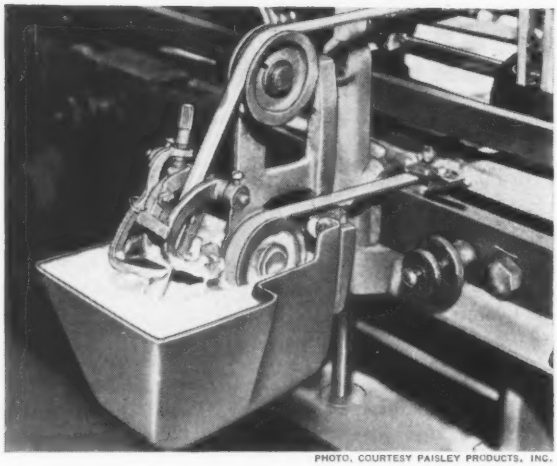
Operating conditions—Operating conditions should be fully explained, covering the following points:

1. Method of application—That is, by hand, spray or spreader. If some special method of application is employed, a detailed account of this should be clearly given.
2. Type of adhesive required—Whether it is hot or cold, including specific temperatures used.
3. Make of machine—If the machine is not of a

PHOTO, COURTESY EDWARD ERMOLD CO.



1—A solid phalanx of bottles moves through this beer labeling machine at the rate of 9600 per hour. The adhesive for the application of the labels must qualify in three ways: it must adhere during dry refrigeration; it must withstand immersion in water; and it must be easily removable to permit re-use of the bottles.



PHOTO, COURTESY PAISLEY PRODUCTS, INC.

2—Glue pot must be kept in top condition. If neglected, it is a dirt catcher and slows production.

standard make, or if a special operation or use is involved, sketches and description of the operation should be included, showing the time of different phases.

4. Type of applicator—Transfer roll, direct roll, etc., including complete description.
5. Time interval—This refers to the lapse of time between application of the adhesive and combining of surfaces.
6. Pressure period—That is, the time during which surfaces are kept under pressure, and the amount of pressure used.
7. Method of drying—Whether this is accomplished by air or by heat, including specific temperature which is used.
8. Setting requirements—Is adhesion expected immediately after release of pressure? If not, how long before positive adhesion is necessary?

3—Pressure-sensitive tape with quick-setting adhesive is used for sealing shipping cases by hand.

PHOTO, COURTESY INDUSTRIAL TAPE CORP.



Conditions to be met—A complete list of conditions which the adhesive film will be required to withstand should be given to the manufacturer.

Government specifications—The manufacturer should be informed if any government specifications are to be met.

Unless a standardized operation with no special considerations is involved, a test quantity of adhesive should be ordered and tried before stocking an adequate normal supply. The chief reason for so doing is that in most packaging operations only a few cents worth of adhesive is involved in the production of many dollars worth of finished products. Since the packager assumes responsibility for any losses which might result from an unfortunate selection of adhesive, it is to his interest to test the recommendation before undertaking full production.

How to store adhesives

Liquid adhesives should be kept at moderate room temperatures at all times—heated rooms in winter, cool locations in summer. These storage conditions are also desirable for dry adhesives which should, in addition, be kept away from water. Therefore, if the floor of the storage room is wet, the bags should be elevated on wooden planks. The significance of an even storage temperature for dry adhesives is seen in its effect on humidity. High, dry temperatures tend to drive off the natural moisture in the glue so that instructions for preparation into liquid form might prove inaccurate.

More important, however, is the absorption of moisture by dry adhesives stored in a wet or damp location. Not only does this produce a tendency to cake, making solution difficult, but also so much moisture may be absorbed that the mixing instructions will fail to produce a satisfactory consistency.

As new shipments of supplies are received, the old ones should be brought forward for easy accessibility and prior use. In other words, all shipments should be used in the order in which they are received and none should be permitted to undergo long aging. This is especially applicable to prepared adhesives.

How to open containers and extract adhesives

There are many types of metal drum. Those with bung holes which contain free flowing materials are ideal for spigot withdrawal. The spigot should be inserted in the head before the drum is placed on its cradle. The air vent on the side of the drum will then be upward and should be opened to facilitate the flow through the spigot. Wooden barrels equipped with bung holes should be arranged in the same manner.

Lock lever type drums without bung holes must be used in an upright position and the head removed for extractions either by pail or scoop. After each extraction, the head should be locked tightly in place to prevent drying out and contamination. This is also

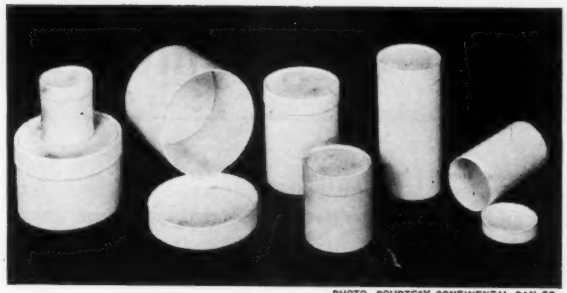
XUM

true of wooden barrels without bungs which contain heavy pastes, etc. In this case, however, it is important not to break in the head of the barrel, but to remove it intact so that it can be reinforced with cross boards and re-used as a cover. This can easily be accomplished with a "driver" or with an ordinary hammer and cold chisel—first withdrawing the nails holding the top hoop in place and removing it, then loosening the second hoop in the same manner before prying out the head. After removing the head, the hoops should be tightened and nailed as before. Since this prevents the cover from refitting tightly, it is advisable to place over the open head of the barrel a heavy piece of wet burlap and wedge it in place with the reinforced wooden cover. This also serves to keep the adhesive moist.

All prepared adhesives which are too heavy to extract from the container through a spigot should be kept at a uniform level within the container. Therefore, after each withdrawal, the sides should be scraped down to prevent drying out of relatively thin films. In the case of heavy pastes, it is a good practice to place a $^1/_2$-in. layer of cold water on the surface which will form an airtight seal and prevent drying out while permitting further extractions without dilution. However, the use of wet burlap, as previously recommended, is sometimes preferred.

How to care for gluing equipment

Cleanliness is essential in all gluing equipment. Scoops, agitators, mixing pails, paddles, glue pots, roller applicators, etc., should be frequently and thoroughly cleansed with hot water or suitable solvent recommended by the adhesive supplier. Large quantities of adhesive are needlessly sacrificed every year by carelessness in this matter. For example, the contamination of a single scoop or mixing paddle can conceivably lead to the spoilage of entire barrels of adhesives. Some types of adhesive are more susceptible than others, but it pays to keep all gluing equipment clean at all times regardless of the type of adhesive.



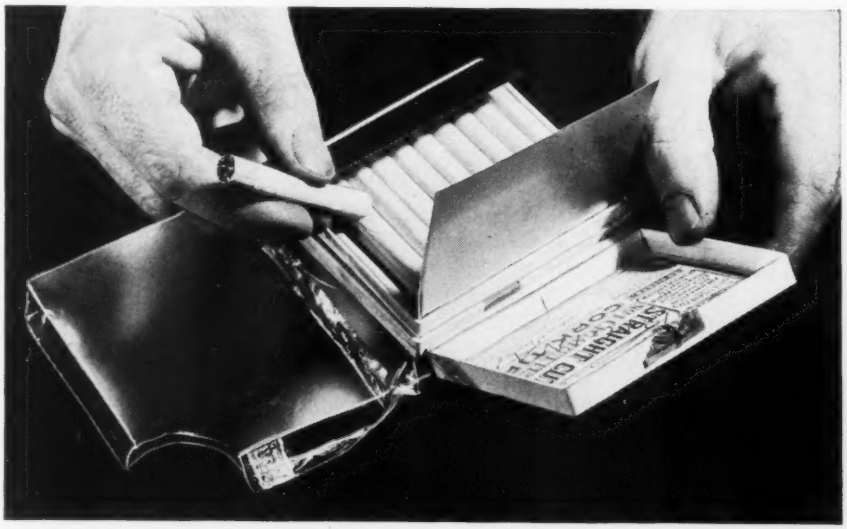
PHOTO, COURTESY CONTINENTAL CAN CO.

4—Spiral-wound paper food container requires adhesives which are nontoxic, tasteless and odorless.

A common receptacle or mixer should not be used with two different types of adhesive unless it is first cleansed and preferably sterilized with a strong disinfectant. An entire container of certain types of synthetic resin adhesive can be ruined merely by contaminating the batch with a brush previously used to apply some alkaline glue. The result is startling in that an immediate separation takes place which causes the solids in the resin adhesive to coagulate. Obviously, an unclean glue previously used with a different type of adhesive could spoil not only the new batch of glue added, but all of the work produced on the machine employed.

Even after thoroughly scouring glue pots at the end of the day, it is a good practice to cover them so that dust and foreign matter will not settle there before the start of operations in the morning.

The importance of cleanliness in the handling of all types of adhesive cannot be overstressed, since a large percentage of adhesive losses due to gluing failures can be attributed to this single source of trouble. Naturally, supplies of any adhesive containing volatile solvents must be kept in airtight containers. Even small quantities in use should be covered to the maximum extent possible.



5—Few smokers realize that the cigarette could not be made without adhesives. The picture shows six places where six different adhesives are used: (1) the cork tip; (2) the side seam; (3) the revenue stamp; (4) lamination of foil to paper inner liner; (5) tight-wrap for the set-up box; (6) the cellophane outer wrap.

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Types of gummed tape

by Juan Oliver

During the past quarter century, the uses for gummed products have expanded by leaps and bounds. There is scarcely an industry today which does not employ gummed paper products in one form or another. Developments and refinements in adhesives as well as increasing markets have resulted in the extension of the gumming industry to include products ranging from the gummed papers used for purely decorative purposes to heavy-duty waterproof gummed tapes.

Gummed products fall into two categories: sealing tapes sold in rolls, and flat gummed sheets for wrapping or converting.

Sealing tapes play a decisive role in the efficient preparation of containers for transportation. They can literally "make or break" a container.

Sealing tapes

Standard gummed tape—35-lb., 60-lb. and 90-lb. gumming kraft, gummed on one side with animal or vegetable glue or dextrine adhesives. These tapes are made in brown as well as in a variety of other colors—red, green, orange, etc., and they may be printed to show the customer's trade-mark or brand name. They are usually sold in narrow rolls to fit standard sealing tape machines, and are used for sealing parcels, bundles or cartons, the heavier weight being selected for the heavier duty.

Extra-heavy gummed kraft—100–160 lb., are used as protective coverings for the edges of such heavy articles as bathtubs, basins and automobile fenders to prevent chipping and scratching while en route from the manufacturer to the retailer.

Slay paper—90-lb., 100-lb. and 120-lb. kraft, coated on one side with a special high-test glue which has very fast-sticking qualities. It comes in brown and in a variety of colors, and is usually made with a slight crease down the center. It is applied to cover the stitches and to reinforce the corners on lightweight boxes.

Reinforced creped kraft—Creped kraft tape reinforced with thread, laminated with asphalt and combined with 60-lb. gummed kraft is used on the "manufacturer's joint" of fibre containers.

Sisal—Creped paper reinforced with sisal fibres, laminated with asphalt and combined with gummed kraft, is used on the "manufacturer's joint" of corrugated containers.

Gummed veneer tape—35-lb., 40-lb., 50-lb. and 60-lb. kraft, gummed with specially blended high-grade glue for high-speed taping of wood veneers. The glue must be free of acids or other ingredients which might destroy the finish of the wood. Veneer tape is used to hold two strips of veneer together until they are firmly adhered to the underlying structure. The tape is then sanded off. There is also some demand for a 35-lb. unsized kraft which is moistened and then removed without sanding.

Corrugated cambrics—These come in two types: duplex paper combined with cloth and gummed on the paper side; and clay-filled, a gummed cloth which has previously been impregnated with clay. Both are used by the fibre container industry to make the "manufacturer's joint" which is an indispensable part of each box. They are made in various weights which may be employed in the manufacture of boxes with different test specifications.

Gummed Holland—Clay-filled gummed cloth used primarily for binding and edging by bookbinders, lampshade, writing pad and envelope manufacturers.

Gummed Albert and Kleco—These are the same type as gummed Hollands, but are stronger inasmuch as the cloth has $2^1/_2$ times as many threads as the Hollands cloth has.

Gummed tablet tape—Embossed paper tape used by tablet manufacturers as binding on pads and other products of similar nature.

Gummed glassine tape—Transparent gummed paper used for mending dollar bills and torn paper of all kinds.

Waterproof sealing tape—Solseal is an asphalt-laminated paper, coated one side with waterproof glue. It was developed for substitution of waterproof fibre containers for wood and metal. The waterproof tape forms an efficient seal for such containers, and ensures the maintenance of moistureproof conditions for the cold storage of perishables. These tapes have been successfully used on containers shipped overseas during the war, and have demonstrated their value on weatherproof boxes under the rigorous conditions to which they have been subjected.

Flat sheets

Waterproof paper—This is made of two layers of kraft, 30 lb. or 60 lb., laminated with asphalt. It is used as wrapping and lining material for the maintenance of moistureproof conditions on railroads, steamships and in warehouses to prevent spoilage of perishables. The electrical and automobile industries also use it for wrapping on fenders, motors, etc., to prevent rusting.

Cloth-lined paper—Cloth, combined with paper, used for the manufacture of tags and labels.

Gummed label papers—For labels, seals, reinforcements and decorative purposes. These come in a variety of papers, coated and uncoated, white and colored.

XUM

Pressure-sensitive tape

by George E. Chisholm

Adhesive tapes which readily adhere to dry surfaces under finger pressure alone are known as pressure-sensitive tapes. These tapes are equally easy to strip from surfaces, and may be removed and reapplied a number of times provided they are not contaminated by dust, lint, fibres or some such foreign substance.

Many types of material may serve as backing for these tapes. Among backings which are used commercially today, either individually or in combination, are: paper, cellophane, cotton cloth, coated cloth, acetate film, acetate cloth, metal foil, glass fibre and asbestos fibre.

A number of factors enter into the selection of backing material for a given job. The following list enumerates the most important of these, although no attempt has been made to stress the order of importance:

1. Strength
2. Thickness
3. Pliability
4. Transparency
5. Color
6. Insulating qualities
7. Resistance to moisture and exposure
8. Resistance to paint solvents, sandblasting, electroplating chemicals and other finishing processes

Pressure-sensitive tapes are used in the packaging of anything from small boxes of cosmetics to huge machinery shipped for export. In the latter case, tape is used to seal openings against dust, dirt and moisture or to protect exposed metal surfaces. Such applications require a strong, pliable tape which will resist moisture and exposure to every kind of weather condition. In some instances, a coating is added.

Pressure-sensitive adhesive tapes are used for a wide variety of industrial, commercial and household uses. Uses may be grouped in eight functional classifications:

1. Masking
2. Sealing
3. Holding
4. Identifying
5. Protecting
6. Insulating
7. Cushioning
8. Reinforcing

Colored tapes and printed tapes are used for purposes of identification and decoration. In consumer packaging, for example, a colored tape may be used to decorate the package with a spot of color—at the same time performing its job of sealing or holding. In large packaging, a colored tape may be used as a code, indicating the nature of the contents. It may also be printed to show the size and type of the contents.

The number of industrial uses for pressure-sensitive tapes is endless. From the standpoint of packaging alone the uses are too numerous to attempt listing them all here. Only some of the more basic applications are suggested. Of the eight functional classifications of tape uses, these are most often found in packaging:

1. Sealing
2. Protecting
3. Holding

PHOTOS, COURTESY INDUSTRIAL TAPE CORP.



1—Pressure-sensitive tape is a valuable "utility player" in the packaging field. Easily applied, it makes a firm bond and can be removed with little inconvenience. Here, it is used for various purposes, such as holding together two members of a "combination sale" and sealing cellophane wrappers around irregularly shaped articles that must be packaged by means of hand operations.



2—Gift packages use pressure-sensitive tape in many places where it does a protective-visibility job.

The tapes which are most often used are the following:

1. Cellophane (transparent and colored)
2. Acetate fibre (a lamination of acetate film and rope fibre)
3. Cotton cloth
4. Coated cloth (for moisture resistance)

Specific applications for these tapes in packaging include:

1. The sealing of packages of all kinds with clear or colored cellophane tape. Boxes of candy, hosiery, food products, stationery and cookies are examples of this application—in short, almost any packaged article where a cover must be held on a closure, or a wrapper held in place.
2. The holding of paper bands around such articles as shirts, socks, shorts, stationery, etc., with cellophane tape.
3. The holding together of units in a combination deal by securing them with cellophane tape—usually transparent but in some cases colored. These combination deals include different varieties of the same products (such as soaps) or related products (such as razor blades and shaving cream).
4. Attaching samples to a packaged product or to a bottle with transparent cellophane tape.
5. Attaching premiums to packaged merchandise with cellophane tape.
6. Attaching key openers to cans with cellophane tape.
7. Sealing canisters with cloth tape, leaving a tab for easy removal. Different colors or printed tapes may be used to identify the contents.
8. Banding heavy merchandise with cloth tape to keep sets together, thus facilitating handling and inventorying. Examples of this usage are: brake linings, heavy hinges, casters, etc.
9. Sealing shipping cartons with cloth tapes. The fact that no moisture is required means that the tape may be applied quickly and that the tape can be removed as quickly. In some cases colored or printed tapes are used to indicate the nature of the contents.
10. Sealing packages for shipment when they are to be packed in shipping cases for moistureproof protection. Both coated cloth tape and acetate fibre tape are used for the wrapping of machinery parts, tools, etc., as protection against rust and corrosion. Small packages are sometimes wax-dipped for further protection. They are then packed in shipping cases which are lined with special waterproof papers.
11. Sealing shipping cartons with moistureproof cloth tapes when the contents require protection from moisture. Coated cloth or acetate fibre tapes may be used, depending upon the amount of strain, the size of the carton and the degree of protection required.
12. For the export shipment of automobiles, trucks, farm machinery and other heavy machinery, coated cloth tapes are used to protect against exposure to the elements. Openings are sealed up with this tape to protect delicate motor parts from rust and corrosion.
13. For the protection of wood, metal or plastic surfaces which may otherwise become scratched or marred in handling or in shipment—for example, desk tops, or sheets of special-purpose metals. Heavy paper or cloth tapes offer protection and may be stripped off easily.

3—Assembly line in large bakery, where cake is wrapped in cellophane, sealed with "tacky" tape.



Wherever quick application and removal are desirable, pressure-sensitive tapes are the answer.

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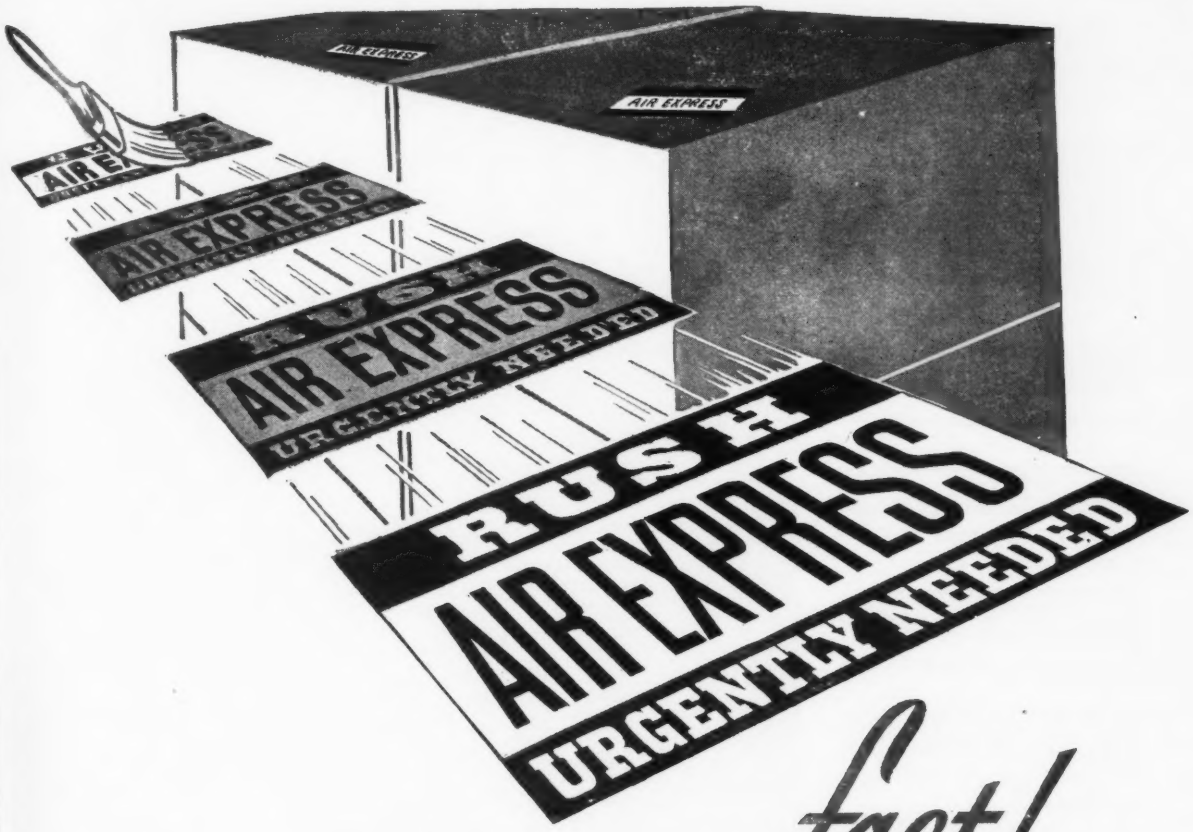


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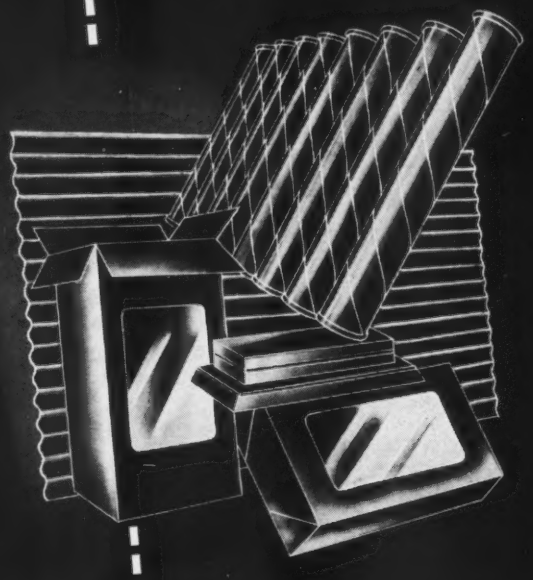
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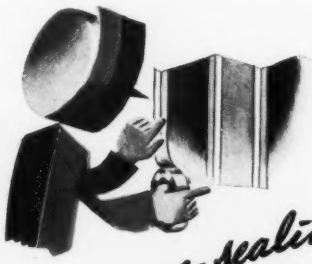


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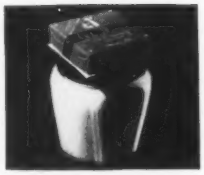
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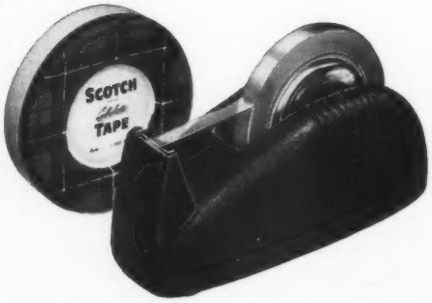
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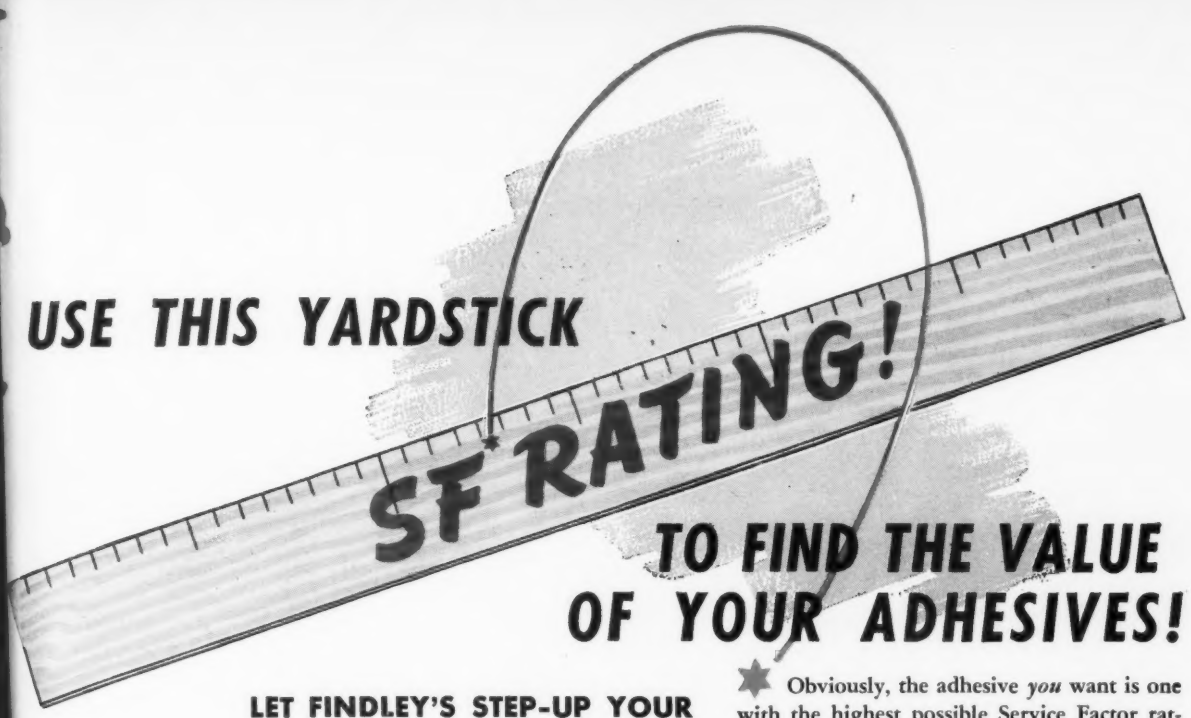


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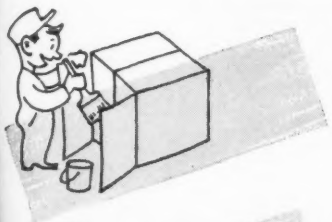
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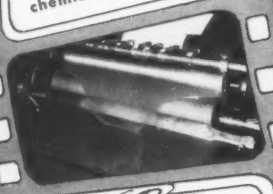
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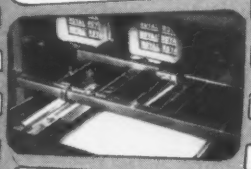
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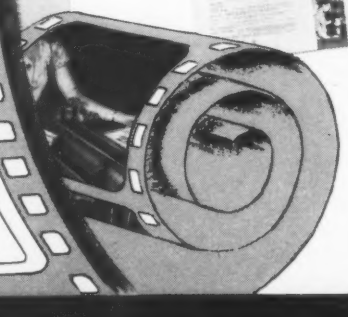
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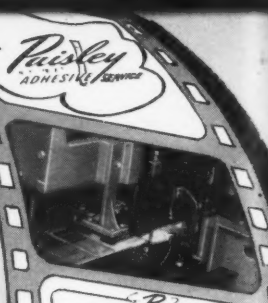


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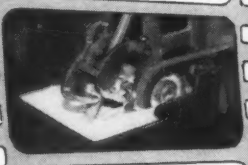
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COATINGS

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Organic protective coatings for packaging

by D. M. Gray

The subject of organic protective coatings in all its ramifications and applications is a most complex and highly technical one. Attempts to make it appear simple and straightforward are bound to be either misleading or ludicrous. However, organic coatings may be systematically classified or grouped by any one of a number of schemes—the best for a particular purpose depending upon the viewpoint, training and interests of the individual consulting the classification.

Definition

Organic protective coatings may be defined as film-forming compounds containing *carbon* in chemical combination. With the advent of silicone resins, the definition must be modified to include *silicon* as well.

The definition must *exclude* films or metallic coatings applied by electroplating and galvanizing; integral metal surface protective coatings such as those produced on aluminum by anodizing and on steel by Bonderizing; and vitreous enamels or low-melting-point glasses, of the nature widely used on sanitary ware. While these exclusions are truly protective coatings, they are not organic chemical compounds and are, therefore, outside the scope of this discussion. However, their protective functions are not infrequently augmented by subsequently applied organic coating films. By way of illustration, can ends for certain food products are made of chemically treated steel (CTS) lacquered with organic baking enamel.

An organic coating may be purely decorative or purely functional. More often, it combines both.

Manufacturers' classification

Manufacturers of protective coatings generally identify each of their products as: a *varnish*, a *paint*, a *primer*, an *enamel*, a *lacquer*, a *dope*, or a *wax* or *polish*. They may further describe these coatings as *clear*, *transparent dyed* or *pigmented* (white, colored and black). Pigmented coatings may again be qualified as *gloss*, *semi-gloss* or *flat*. All of these coatings may be classified as: *interior*, *exterior* and *product* finishes or, more simply, *structural* finishes and *industrial* finishes. These groupings, however, are neither informative nor acceptable from a packaging standpoint, where interest lies in protection for light gauge metals.

Physical group classification

The engineer, manufacturing packages and packaging materials, prefers a classification which tells him whether the material is a hot-melt, a latex, an emulsion, or a coating containing combustible solvents. He is interested in whether, following application, it requires a bake or forced dry or whether it can form a protective film by air drying at room temperature. He is also concerned with the total solids content of the liquid coating or lacquer, its viscosity and drying rate. If the coating is a heat-converting or oxidizing type of material, the packaging engineer must know the temperature required. If it is a solvent type, he must be aware of the combustibility of the solvent. From the packaging engineer's standpoint, protective coatings may be classified by their physical state in the following way:

Group 1—Hot-melts (100 per cent solids), fluid at elevated temperatures, typified by waxes and wax-resin mixtures.

Group 2—Nonsolvent dispersions (100 per cent solids), fluid at room temperature, setting-up to solids at elevated temperature, like vinyl resin plastisols.

Group 3—Latices and emulsions (less than 100 per cent solids) with water as the solvent or dispersing agent, such as natural and synthetic rubber and resin latices and emulsions, drying or coalescing to solid films by loss of water.

Group 4—Lacquers, varnishes and enamels (less than 100 per cent solids) in organic solvent solution or dispersion, including cellulose nitrate and vinyl resin lacquers and oleoresinous baking varnishes. For this type of coating, drying or transition from a liquid to a solid film is accomplished primarily by the expulsion of solvents, combined in some cases with chemical changes in the solid portion caused by oxidation, polymerization or condensation.

Functional classification

From the standpoint of the packer or user of packages and packaging materials, coatings might be considered by their functional properties in film form along the following lines:

1. *General appearance*—Color, transparency, hide, gloss
2. *Flexibility*—At normal and extreme temperature, plus the ability to stand fabrication and forming
3. *Transmission properties*—For water vapor and gases
4. *Resistance*—To grease and oil
5. *Outstanding chemical resistance*—To acids, alkalis and solvents, including water
6. *Odor and toxicity characteristics*—Freedom from odor or flavor and various questionable toxic ingredients
7. *Adhesive characteristics*—a) Adhesion to base metal, paper or fibre; b) nonblocking or tack

properties; c) heat-sealability and bonding properties

8. *Physical resistance*—a) To abrasion and scuffing, b) to deterioration by sunlight
9. *Flammability*—Combustible or nonflammable
10. *Cost*—Always a factor

To have extensive commercial utility for packaging, with its diverse and specialized requirements, a good coating *must* have (among the items listed above):

Good flexibility
Low odor or flavor
Good adhesion to base material
Reasonable cost

It is only slightly less important that it *should* have:

Good general appearance
Low water-vapor transmission
High oil and grease resistance
Nonblocking properties
Good abrasion and scuff resistance

Depending upon the particular requirements of the application, it *may* have to possess one or more of the following properties:

Low combustibility
Good steam and hot water resistance
Outstanding chemical resistance
Good heat-sealing and bonding properties
Good sunlight resistance

Other special properties may also be desirable.

Chemical classification

The supplier of protective coatings, called upon to furnish coating material meeting a combination of requirements such as those listed in the functional classification above, will probably turn to a coating classification based upon the chemical make-up of the resinous or film-forming vehicle or solid portion of the coating. On the basis of the properties of these materials, he will select for the formulation the resin type most closely approaching the technical requirements—meanwhile keeping an eye on costs.

The chemist's classification for resin films and waxes is along the following lines:

Oleoresinous—The term covers a combination of drying oils with natural and (more often) synthetic resins.

Alkyd—Alkyds are actually closely related to the oleoresinous class, but due to extensive commercial use are considered separately. They include combinations of drying oils or fatty acids with polyhydric alcohols, such as glycerine, and polybasic acids such as phthalic and maleic.

Phenolic—These may be used straight, or modified with other resins or rosin in lacquer-type solvents. If soluble in drying oil, they fall into the oleoresinous group.

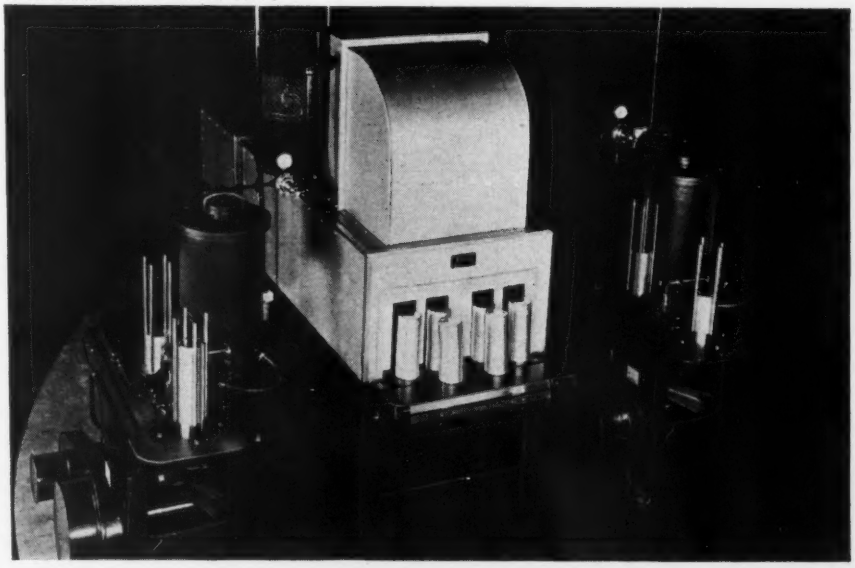
Urea-formaldehyde and melamine-formaldehyde—Both of these resins are almost always used in combination with drying or nondrying alkyds.

Cellulose nitrate, cellulose ester and ether—Such compounds, used in lacquer type solvents, are generally modified with alkyds and other resins or with some suitable chemical plasticizers.

Vinyl—These include polyvinyl esters, copolymers of vinyl and vinylidene ester-halide, polyvinyl and vinylidene halides and polyvinyl aldehydes, usually in lacquer-type solvents, frequently with alkyd or other plasticizer.

Other resins—Less widely used than the preceding six types (for reasons of cost, availability or recent commercial introduction) are natural and synthetic rubber, including chlorinated and cyclicized varieties as well as copolymers. Polystyrene, polyethylene, polybutylene, polyamides, silicones, petroleum resins, glue,

PHOTO, COURTESY DEWEY & ALMY CHEMICAL CO.



Thermoplastic organic coating applied to can ends for protection. Automatic lining machines attain high speeds at a temperature of 235 deg. F. (Brief cooling is sufficient.)

alphaprotein, casein and zein are also among the less widely used organic coating materials.

Waxes, natural and synthetic—Mineral, vegetable and animal waxes such as paraffin, proprietary microcrystalline waxes from petroleum, ceresin, carnauba, spermacetti and others, alone or combined with other resins, are usually used as hot-melts or emulsions.

Balancing properties

To provide all of the properties required of a particular coating for packaging purposes, whether the application be as an interior lining for a food can or a paper coating for heat-sealed packages of a dry but hygroscopic food product, the protective coating chemist frequently employs blends of two or more of the above types of film-forming materials. In such blends, the desirable or outstanding properties of one type complement, reinforce or modify the properties of the others. This makes the chemist's job more complex. However, almost unlimited possibilities thus exist for producing a specialized coating for a specific purpose.

By reason of his knowledge of the specific advantages and disadvantages of each type of material, the chemist dealing with protective organic coatings might have a mental picture of available materials, somewhat like that indicated in Table I. Due to limitations of space, the table is necessarily greatly abridged. A complete version, however, would be so comprehensive that even the excellent sets of large size wall charts, listing the properties of each of the different resins, would not give the entire information. Specific resins of a given type will sometimes vary widely in particular properties, as for example, in flexibility, color, chemical resistance, water-vapor transmission and others. Only general types of resin are listed on the table, and the property ratings of necessity represent averages rather than extremes or special cases. Nevertheless, a study of the ratings given and a comparison of the total "scores" with the corresponding costs should prove thought-provoking in devising coatings technically and economically sound for packaging purposes.

TABLE I—SOME AVERAGE PROPERTY RATINGS OF FILM FORMING COATING MATERIALS*

	Properties	*Oleoresinous*	*Alkyds*	*Phenolics*	*Urea-formaldehyde and melamine*	*Cellulose nitrate*	*Vinyls*	*Other† resins*	*Waxes*
PRIMARY IMPORTANCE	FLEXIBILITY	G	G	P	F	G	E	...	F
	ABSENCE OF ODOR AND FLAVOR	F	G	F	E	G	E	.	G
	ADHESION TO BASE MATERIAL	G	G	G	G	E	G	...	F
	COLOR (WATER WHITENESS)	F	G	P	E	G	E	...	G
	WATER-VAPOR TRANSMISSION‡	F	G	G	P	G	G	...	E
	NONBLOCKING	G	G	E	G	E	E	...	P
	ABRASION AND SCUFF RESISTANCE	F	G	E	G	G	E	...	P
	OIL OR GREASE RESISTANCE‡	F	G	E	G	G	E	...	P
SECONDARY IMPORTANCE	STEAM OR PROCESS RESISTANCE	F	G	E	G	P	P	...	P
	ALKALI RESISTANCE	P	F	G	G	F	E	...	E
	ACID RESISTANCE	G	F	E	G	F	G	...	E
	ALCOHOL RESISTANCE‡	P	F	E	G	F	E	...	E
	HEAT SEALABILITY‡	P	P	P	P	G	E	...	E
	SUNLIGHT RESISTANCE (CLEAR FILMS)	G	G	P	G	F	F	...	E
	NONCOMBUSTIBILITY OF FILM	F	F	G	G	P	G	...	F
	TOTAL SCORE (EXCLUDING COST) 69 = PERFECT	27	37	41	43	47	58	...	34
	RAW MATERIAL SOLID RESIN COST RANGE ($ PER LB.)	0.15–0.25	0.20–0.30	0.25–0.45	0.25–0.40	0.20–0.35	0.30–0.80	0.15–0.85	0.05–0.15

* In this table, the properties discussed under the heading "Functional Classification," p. 588, are arranged arbitrarily according to their importance from a packaging standpoint. For convenience the following code is employed: E—Excellent, G—Good, F—Fair, P—Poor. Properties above the first pair of double horizontal lines are considered of primary importance and are given twice the rating value of the secondary properties listed between the two sets of double horizontal lines. Values are assigned as follows:

For primary properties: E—6, G—4, F—2, P—0.

For secondary properties: E—3, G—2, F—1, P—0.

According to these figures, a coating which possesses a perfect combination of properties would be given a rating of 69. The numbers in the column entitled, "Total Score," represent an average rating for each type of coating material.

† Properties too diversified for even an approximate rating.

‡ Depending upon formulation of the lacquer.

Basic principles of coatings

No one coating offers the panacea for all protective problems. The trend is, therefore, toward the development of specific coatings for specific problems. Certain purposes, for example, are served by the so-called spirit varnishes. These have quick drying properties and are low in cost. Where only a limited amount of protection is required, these varnishes are adequate. However, they exhibit a tendency to soften in warm weather and to crack in cold weather, and they are lacking in resistance to abrasion.

Developments of synthetic materials, such as rubber derivatives, cellulose derivatives, vinyl, methacrylate and polyethylene resins are looked upon by the packaging industry with keen interest, for through combinations and modifications of these a wide range of properties may be obtained. In almost all cases these materials give a good-looking finish, and their effect on appearance is taken for granted and is subordinated to their protective properties, i.e., resistance to oils, moisture, acids, alkalis and the elements. Tables I and II (pp. 594 and 595) will indicate what to expect from some of the more common film-forming materials. (See also *Some New Coatings*, p. 599 and *Organic Protective Coatings for Packaging*, p. 588).

Today, many liquids and oils are being packed in paper containers, and many industries are effecting economies by the use of coated papers. Coatings have been used to protect whisky labels from the effect of alcohol; soap wraps from discolorations and fading due to alkalis; oil labels from being stained by the oil; and salt and cocoa from becoming caked by moisture while in their containers.

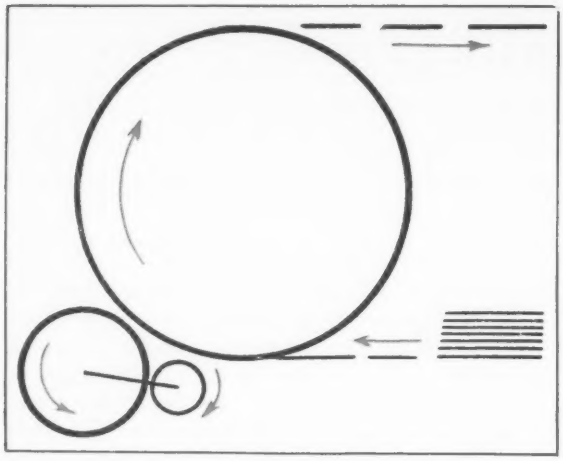
In discussing coatings for paper and sheet materials the basic reason for their need and use should be considered. Probably no single sheet material embodies more than a few of the numerous properties frequently necessary to meet packaging requirements. Most papers, for example, in their unadorned state offer little more than raw materials. These, we might say, can be alloyed with other materials, thereby building into them certain functional properties such as moisture resistance. Most coating compositions intended for application to a base sheet, whether it be paper, cellulose film or a metallic foil, involve the use of a key material, commonly referred to as a film former. Generally it is this key material which determines certain characteristic properties in the finished article. The film former more often than not is responsible for the type of chemical resistance, the degree of grease or water resistance that is obtained. It provides the basis for possible heat sealing properties. On the other hand, the film former is not, as a rule, responsible for water-vapor resistance. That property, if required in packaging material, must be secured by resorting to proper formulation—frequently the judicious addition of waxes. Only rarely does a coating composition consist of a single ingredient. Due to the "alloying" of materials, two coated sheets similar in appearance and even utilizing the same basic or key ingredient may exhibit entirely different properties when evaluated from the viewpoint of an important functional requirement.

By far a greater number of functional coatings recently developed aim at increased water resistance, increased water-vapor resistance and increased resistance to gas penetration, or penetration of oils and fats. The greater number of coatings developed to secure water resistance involve the use of thermoplastic materials such as asphalt, waxes and synthetic resins. These are largely extensions of the well-known principles which have been used for so many years in the manufacture of waxed glassine and cold-waxed butter cartons. For severe service, a film must be reasonably continuous—that is, without pin holes or other uncovered portions. Cellulosic materials, because of their essentially porous nature, are not entirely compatible with this aim and many of the newer water-resistant sheets are given a preliminary treatment by conventional coating processes with materials resistant to the penetration of waxes and asphalt. This imparts to the base an oil-resistant continuous film which will prevent irregular penetration of the water-resistant film. Most of the preliminary coatings consist of plasticized animal glue (see *Processing Packaging Papers with Animal Glues*, p. 615) or similar materials, but the newer synthetic films, such as methyl cellulose, have also been used successfully for this purpose. All of the functional coatings involve the basic principle of coating paper to permit application of continuous films without excessive penetration of the coating material which has been selected for a specific end use.

Developments in resinous materials

The rapid strides in the development of resins and their uses in packaging have been brought about by carefully planned and directed research. A brief survey of the materials, the methods by which they are manufactured and their packaging uses is given below.

Rubber derivatives—Rubber in one form or another has always been used for water- and vaporproofing. However, its high viscosity, residual tack, lack of transparency and its general difficulty in handling have made it practically useless as a protective coating for paper. Modern research has developed from a very high grade of rubber a resin which can be handled very much like any other coating solution adaptable for application to paper. Moreover, this resin, which is a cyclized derivative of rubber, is an improvement over the raw rubber



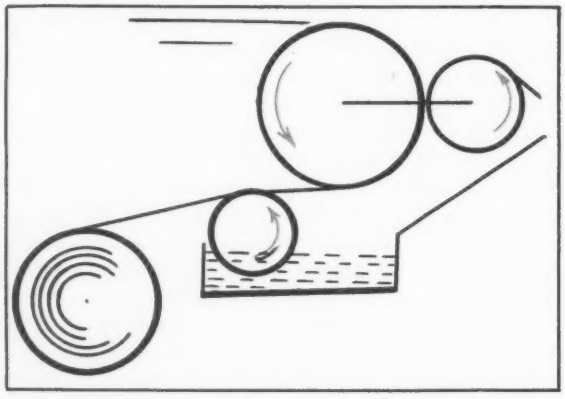
1—Varnishing machine principle—the sheet is drawn over the roller by a revolving drum with grippers.

in water- and vaporproofness. It is soluble in a variety of aromatic and aliphatic hydrocarbons and leaves a clear, glossy, transparent, heat-sealing film highly resistant to moisture, acids, alkalis and alcohol. It contains no chlorine.

Another rubber derivative very suitable for use as a paper coating is a product known as chlorinated rubber or rubber chloride. It results from the reaction of chlorine on rubber in which the chlorine content may vary between 61.5–68 per cent. The theoretical calculation of the chlorine content is generally higher than the practical since crude rubber is made up of a soluble portion which is very reactive and a gel which is much less reactive.

Both the above-mentioned rubber derivatives are extremely useful as protective coatings where good resistance to moisture penetration, acids and alkalis is desired. They can be formulated to produce good, flexible films with excellent gloss retention. The cyclized rubber derivative, however, is more suitable for heat-sealing purposes, since it is more stable to heat than the rubber chloride and is produced in various

2—Using reverse roller principle, this type of machine is adapted for application to web-fed film.



grades with various melting points. Both of these materials are unaffected by alcohols, but are attacked by gasoline. Their use on glassine or other hard-surfaced papers has given results which make these coatings extremely useful in packaging where high moisture resistance is required. On glassine paper, the cyclized rubber derivative is used with as little as $1\frac{1}{2}$ lb. per 3000 sq. ft. of solid coating on each side of the paper, to give water-vapor transfer rates of 1–5 grams of water per square meter per 24 hr. at a relative humidity differential of 100 to 0 per cent. In comparison, the uncoated paper has a water-vapor transfer rate of over 1000 grams per square meter under the same conditions. This same cyclized rubber derivative is also used on kraft paper to give a high strength sheet which is very resistant to the passage of moisture. This sheet has a high finish, is heat-sealable, and offers many opportunities for using high strength paper in the field of large commodity bag packaging.

Uses of rubber derivatives—The outstanding advantage of these coatings is that they are nontoxic and usable for food packaging where high moisture resistance is required to prevent caking of such items as salt and cocoa or to prevent staleness of biscuits, corn flakes, potato chips, pop corn, etc.

The chemical resistance of these rubber derivatives allows for wrapping and packaging of such materials as soaps and detergents and prevents discoloration of the wrap by the alkalis.

Vinyl polymers—Vinyl chloride and vinyl acetate are formed by passing acetylene through hydrochloric acid and acetic acid, respectively. The molecules of these compounds are characterized by the possibility of joining together with other like molecules to form larger molecules possessing the same empirical composition. Thus, when vinyl chloride and vinyl acetate are each treated with catalysts, they are polymerized to form polyvinyl chloride and polyvinyl acetate, respectively. This chain reaction can be controlled to various degrees of polymerization and the degree of polymerization determines the average molecular weight as well as some of the more important properties of the polymer.

Polyvinyl chloride is high in tensile strength, has good chemical and water resistance. However, it has poor solubility in most organic solvents and is, therefore, limited in its use as a surface coating.

Polyvinyl acetate, on the other hand, has properties which are quite different. Its softening point is as low as 30 deg. C. and it has a high water absorption and tacky nature. It is more useful, consequently, as an adhesive rather than a surface coating.

A joint polymerization of these two compounds simultaneously, however, with a content of about 85–87 per cent vinyl chloride, yields a product which is soluble in many organic solvents suitable for use as mediums for adapting the resin for surface coating. What actually happens is that the vinyl acetate, when copolymerized with the vinyl chloride, internally plasticizes the polyvinyl chloride while retaining most of the properties

which are always attributed to the polyvinyl chloride.[1]

A large variety of compounds can be made with varying properties by the copolymerization of these two materials, by controlling the average molecular weights and by altering the vinyl chloride to vinyl acetate ratio.

Uses of the vinyl resins—Vinyl resins of this nature find their most extensive uses in paper coatings where good resistance to acids, alkalis, oils, gasoline and alcohol is required. They have already found successful application in paper liners for bottle caps, fibre containers for holding oils, fibre cartons used for packing cellulose nitrate which is kept wet with denatured ethyl alcohol, labels and box papers for improving the appearance as well as for resistance to the above-mentioned materials.

Vinyl resins in general have excellent heat-sealing properties and water resistance; are nontoxic, odorless, tasteless and practically water-white. This makes them ideal for use in food containers and wrappings. They have been used for packaging dairy products, such as butter and cheese, and they have also been used on the hoods of milk bottles.

The vinyl acetate polymers have extremely high thermo- and cold-adhesive qualities, and are quite extensively used as adhesives in the packaging field. They, too, are nontoxic, odorless, tasteless and colorless, but the water absorption is rather high. However, water does not dissolve polymerized vinyl acetate. This type of resin is used for sealing paper milk containers, paper drinking cups for both hot and cold liquids, as well as a seal for cellophane and cellulose acetate film. It can be coated by the regular methods and makes fine heat-sealing papers.

Methacrylate resins—The methacrylate resins also belong to the vinyl group, chemically speaking, and are made basically from coal, air, water and petroleum. These resins are made from various esters such as ethyl, methyl, butyl and isobutyl derivatives.

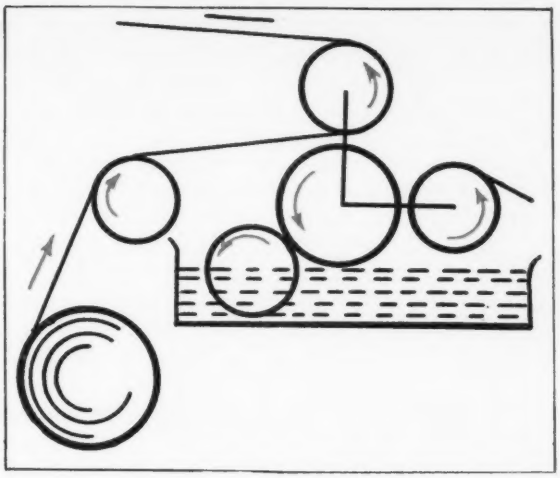
To date, the most extensive use for acrylic resins has been in molding. However, they are soluble in a large variety of solvents and are suitable for coating. The ethyl methacrylate, however, is probably the best suited for this work, since the methyl polymers which are used chiefly in plastics are too hard and brittle for coating. The butyl polymers, moreover, are too soft and sticky for such applications.

The acrylic resins are water-white, thermoplastic and have good resistance to water and inorganic chemicals. They have not been fully explored as yet in this particular field, inasmuch as they have been very costly.

Polystyrene resins—Polystyrene resin, also known as vinyl benzene, has ideal potential properties for protective coatings. However, their only drawback is hardness and lack of flexibility. Formulating chemists have for the past few years been hard at work improving some of the properties of styrene.

Cellulose derivatives—Cellulose nitrate, ethyl cellulose and cellulose acetate have also been used to a great extent for coatings for paper. However, their usefulness is much more limited than the other thermoplastic, high molecular weight, film-forming resins mentioned. Good moisture-resistant cellulose nitrate lacquers and fair oilproof cellulose acetate, as well as good thermoplastic coating from ethyl cellulose, have been made. However, these materials do not have as many inherent physical and chemical properties as do the thermoplastic resins. They have to be modified in so large a measure by other ingredients that, in many cases, they lose their advantages. Nevertheless, in paper work these materials have found large uses on coated labels and fancy box papers. Moistureproof cellulose nitrate lacquers have been used on both cellophane and glassine with good results. The one outstanding disadvantage of cellulose nitrate lacquers is their high rate of inflammability, requiring care in handling and storing.

[1] These copolymers of vinyl acetate and vinyl chloride are manufactured and sold under the name of "Vinylite."



3—Another type of reverse coater has a roller operating in a lacquer bath attached to a distributor.

General characteristics of resinous coatings—In general, all coatings mentioned give good scuffproofness and good gloss, which enhance the appearance and serviceability of the package.

The thermoplastic type of material is best suited for heat-sealing, and bags can be made and sealed with only heat and pressure. In general, temperatures of approximately 300–400 deg. F. are required.

The above statements are all relative and general. The efficiency and advantage of any of the materials mentioned will depend upon the precise development by the lacquer manufacturers of these materials for particular packaging uses.

In application, the lacquers made from these new synthetic bases vary little from the conventional methods of coating.

General handling

The equipment for applying the coatings has not changed much, although many new improvements have been made and can be made to bring it up to present-

TABLE I—GENERAL RESISTANCE

	Cyclized rubber	*Chlorinated rubber*	*Vinyl copolymer*	*Polyvinyl acetate*	*Acrylic resins*	*Cellulose nitrate*	*Cellulose acetate*	*Ethyl cellulose*
ACIDS, WEAK	Excellent	Excellent	Excellent	Good	Good	Fair	Fair	Fair
ACIDS, STRONG	Excellent	Excellent	Excellent	Good	Good	Poor	Poor	Poor
ALKALIS, WEAK	Excellent	Excellent	Excellent	Good	Good	Poor	Poor	Excellent
ALKALIS, STRONG	Excellent	Excellent	Excellent	Good	Good	Poor	Poor	Excellent
SALT SPRAY	Good	Good	Excellent	Good	Fair	Poor	Poor	Fair
ALCOHOL	Excellent	Good	Excellent	Poor	Poor	Poor	Poor	Poor
GASOLINE	Poor	Good	Excellent	Good	Fair	Good	Good	Poor
MINERAL OIL	Poor	Good	Excellent	Good	Fair	Fair	Good	Fair
VEGETABLE OIL	Poor	Poor	Excellent	Good	Fair	Poor	Good	Poor
ANIMAL OIL	Poor	Poor	Excellent	Good	Fair	Fair	Good	Poor
ESSENTIAL OIL	Poor	Poor	Poor	Poor	Poor	Poor	Good	Poor

day developments in all the mechanics of the process.

Drying the volatile solvents, many of which can create fire and explosive hazards if not properly handled, is still a problem. Ample ventilation and exhaust should be provided and care should be exerted not to use make-shift drying equipment.

All equipment should be grounded, and provisions should be made to decrease the development of static charges. Smoking or lighting of matches should be strictly prohibited. Employees should be acquainted with the seriousness of these hazards so utmost precautions will be followed.

There are definite explosive ranges for most volatile inflammable liquids. These limits lie between a minimum concentration and the maximum concentration of the liquid vapor with air or oxygen. If the concentration of the vapor is below the minimum concentration or above the maximum concentration there is little danger of propagation of a flame on contact with the source of ignition. In other words, if the vapor concentration with air is below the minimum concentration, it is too lean to explode and if the vapor concentration is above the maximum concentration, it is too rich to cause the danger of explosion.

The following is a list of the more common solvents and their explosive limits compiled by the Committee on Inflammable Liquids of the National Fire Protection Association:

Solvent	*Lower*	*Upper*
Benzol	1.5	8.0
Butyl acetate	1.7	15.0
Ethyl acetate	2.2	11.5
Ethylene dichloride	6.2	15.9
Gasoline (C_8H_{12} to C_9H_{20})	1.3	6.0
Isopropyl acetate	2.0	5.26
Methylethyl ketone	1.8	11.5
Toluene	1.27	7.0
Xylene	1.0	5.3

To increase the safety margin of the explosive limits of solvents still further, it has been recommended by the New York State Labor Department that enough ventilation be provided to increase the lower explosive limits to four times the actual determined explosive limit.

In other words, stating one hypothetical case, if it required 2000 cu. ft. of air below the minimum explosive limits, it is recommended that four times that amount of air or 8000 cu. ft. actually be mixed with the vapor. The safety factor is thus increased to four times the theoretical limits. As a general guide, approximately 10,000 cu. ft. of air should be mixed with each gallon of volatile liquid evaporated.

Hot melts

Although much progress has been made in the development of hot-melt coating, one of the difficulties and retarding forces in the past has been the lack of adequate coating apparatus.

Hot melts in general are mixtures of resins and waxes which melt into a liquid when heated to viscosities low enough to be coated. The melts are limited at present to materials of relatively low melting points and are not generally suitable for high temperature exposures. The melts are applied to paper much the same way as solvent type coatings. Some comparative data for these coatings are listed below:

Solvent types	*Hot-melt types*
1. Greater range of film-forming materials	1. Less expensive materials are suitable
2. Better range of application, especially in lightweight coatings	2. Quick setting
3. Harder surface coatings and better scuff resistance	3. No solvents and their hazards
4. Better cold flexibility	4. No drying apparatus or ventilating problems
5. Better flow out and better appearance	5. Better moisture resistance due to high concentration of waxes used
6. Higher heat resistance	6. Less losses due to evaporation of solvents
7. No problems in heat decomposition of materials	

In general, the advantage of the solvent type of coating is in the properties of the coating, while the advantage of the hot melts lies chiefly in the mechanics of application. In the hot dip method, machine parts are dipped into hot solutions and a protective coating is easily peeled cleanly from the part. This method is very successfully used on smaller parts, especially those of odd shapes. There is no mess or oil to clean when

being unpacked. The coating provides excellent protection from the atmosphere and also prevents damage to the parts during shipment. Since metal parts are generally cold when immersed, the melt sets almost immediately upon removal of parts from the bath. Continuous operations of dipping and setting are relatively simple when using this process.

A solvent type of strip-off coating has also been developed for protective covering. A lacquer, generally of the vinyl type, is sprayed on the parts until a film of approximately 0.003 to 0.030 in. thick is deposited, depending upon the type of protection desired. Since vinyls have poor adhesive qualities, but excellent film-forming properties with a tensile strength in the range of 2000 to 4000 lb. per sq. in., it can easily be stripped leaving a clean surface. This method is particularly applicable in protecting large equipment on which the dipping method is impractical.

Varnishing machines

Coating in sheets is generally accomplished on a so-called varnishing machine which consists of a reservoir in which the liquid is poured. Running in this reservoir is a distributing roller with an attached doctor roller, which regulates the amount of coating to be applied to the sheet. The sheet is drawn over the distributing roller by means of a large revolving drum equipped with grippers. These grippers hold the sheets firmly to the drum as it revolves. At the same time, they draw the paper over the distributing roller with the regulated amount of coating. The sheet picks up the coating, is then released on an endless belt and carried through a heated oven to be dried.

Although this type of equipment has served the industry successfully for years in applying spirit varnishes which are used chiefly for good appearance, a little more careful handling and thought to details must be given if this method is to be used successfully for applying protective coatings. Like the chain with its weakest link, the protective quality of the finished product is only as good as the continuity of its film. Pinholes, bare spots and not enough coating will cause the sheet to become useless.

The machines have been modified to the extent of varying the speeds of the distributing roller, so that the sheet wipes against the roller instead of kissing it.

The modification tends to eliminate any streaks in the coating and to provide for more uniformity and a wider range of thickness control. Another modification has been to reverse the distribution roller in such manner that it runs in the opposite direction to the motion of the large drum and the sheet, and thus lays down a smooth streakless coat. This is, perhaps, the best method. However, since the operating details have not as yet been satisfactorily worked out, more information is not available.

Reverse-roller equipment

The second method to be discussed is the reverse-roller coating equipment, of which there are several different types for production in the web or roll, rather than sheet. At present, there is no question about the merits of this type equipment. With these machines, accuracy and uniformity can be obtained satisfactorily without too much difficulty.

One reverse roller type of machine consists essentially of a roller about half submerged and operating in a tank filled with lacquer. The paper runs over this roller in the opposite direction to its motion, picks up the lacquer and is carried between two rollers attached in wringer fashion. One of the rollers is stationary and revolves in the direction of the paper. The other roller is adjustable and operates in reverse direction to the movement of the paper. To the adjustable roller is attached a doctor blade which wipes down the excess lacquer which is picked up from the paper. Very accurate results for the weight of coating can be obtained from a machine of this type. In fact, actual calculations of the amount of coating to be applied can be determined before operation starts.

Another popular type of reverse-roller coater has a roller operating in a lacquer bath. To this roller is attached a distributing roller, which picks off the lacquer from the roller in the bath. To the distributing roller are connected two adjustable auxiliary rollers at approximately 90 deg. from one another. One of these auxil-

TABLE II—PHYSICAL PROPERTIES

	Cyclized rubber	*Chlorinated rubber*	*Vinyl copolymer*	*Polyvinyl acetate*	*Acrylic resins*	*Cellulose nitrate*	*Cellulose acetate*	*Ethyl cellulose*
SPECIFIC GRAVITY	1.07	1.57	1.35	1.20	1.18	1.65	1.27	1.14
SPECIFIC VOLUME, IN.^{3}/LB.	26.0	16.98	20.6	24.2	23.3	16.26	20.2	23.91
COLOR	Very light	Light brown	Water-white	Water-white	Water-white	Very light	Water-white	Very light
ODOR	None	None	None	None	None	None	None	None
TASTE	None	None	None	None	None	None	None	None
FLAMMABILITY	None	Low	None	None	None	High	None	Low
HEAT SEAL	Excellent	Poor at high temp.	Excellent	Excellent	Excellent	Fair	Fair	Good
RESISTANCE TO AGING	Fair	Fair	Excellent	Excellent	Excellent	Poor	Excellent	Excellent
WATER RESISTANCE	Very good	Very good	Very good	Poor	Good	Fair	Poor	Poor
WATER - VAPOR IMPERMEABILITY	Excellent	Excellent	Good	Poor	Fair	Good	Poor	Poor
TOXICITY	None	None	None	None	None	None	None	None

iary rollers has a doctor blade attached to it, operates in reverse of the distributing roller and regulates the amount of lacquer on the distributing roller. Between the second auxiliary roller and the doctored-off portion of the distributing roller, the paper passes also in a direction opposite to the rotation of the distributing roller.

Rotogravure

Rotogravure printing is also being used to apply lacquers to paper in web form. Recently, presses have been designed with closed fountains, which are ideal for lacquer work.

However, use of rotogravure applications of lacquer for protective work has limitations: first, in the amount of coating applied and, second, in the continuity of the film. The lacquer is applied by means of etched rollers. The formulation of the lacquer must be such that it forms a uniform film before the lacquer has begun to dry.

Baking

After the lacquer is applied, the sheets or web pass through a heated oven. These ovens are generally 30–40 ft. long and are constructed of sheet iron lined with asbestos. The source of heat is either the open gas flame, steam coils, hot air or, more recently, infrared lamps. Of all these, the open gas flame is the least desirable, since it affords a definite fire hazard when used with lacquers.

Although many of the lacquer bases are noninflammable, the solvents used in them will flash at relatively low temperatures. The other types of heat are safe and, with such other necessary precautions as adequate ventilation, static control and proper electric equipment, little if any danger is to be feared from the fire hazard.

One development in designing ovens has come about by the use of synthetic coating materials. It has been found that thermoplastic compounds will flow out when sufficient heat is applied to make them melt. Since the heat required to bring about this change of state is generally high enough to scorch the paper, the heat is applied only for an interval of 5–10 seconds, depending upon the amount of heat used. In most cases, about 400 deg. F. is used for 5–10 seconds after the heated sheet has passed through the regular oven at 150–200 deg. F. The result of this flash bake is a beautiful, smooth, high-gloss finish.

With infrared lamps, no ovens are required, since the air is not used as a medium for conveying the heat energy. Infrared lamps give off rays which are not absorbed by air. The efficiency of this method, however, depends on the material being heated. That is, if the material has the ability to reflect or transmit rather than to absorb these radiated rays, no amount of drying time will be adequate. However, if it does have the ability to absorb these rays, excellent drying facilities by this method can be arranged. Paper absorbs only a small amount of these rays, especially if the paper is white, and it is believed to be an impractical method of drying lacquers efficiently on paper.

Selection of paper

The selection of the proper grade of paper is of vital importance to obtain maximum results. A grade of paper not suited for lacquering is extremely costly and the results are inadequate. Too much emphasis cannot be placed on the selection of paper stock. In considering paper for a protective lacquer, it must be remembered that it is only the film formed above the fibres which gives the most effective protection. Consequently, it goes without saying that papers which allow the least amount of coating to penetrate are best.

A convincing illustration of this fact was demonstrated in work with moistureproof lacquers. In an application of approximately $1^1/_2$ lb. of solids on each side of a glassine sheet over a 3000-sq. ft. area, a series of readings have revealed 0–5 g. of moisture transmission per 24 hr. per square meter. In an application of coating to a paper stock that was picked at random, but which was being used for lacquering, readings were 50–60 g. of moisture penetration. It wasn't until about 3–4 lb. of coating were applied to each side that favorable readings were obtained for the paper picked at random. Furthermore, an additional amount of coating on the glassine sheet gave no better results than the initial amount stated above. Thus, there is a limit to the amount of protection you can get and this maximum limit can be obtained much more quickly and at a greater saving with the proper paper. It is much cheaper to treat a paper properly in the mill than to apply an excess of lacquer to make up for paper deficiency.

Paper to be used for lacquering should have a hard surface free from pores, grooves and standing fibres. In most cases, a super calendered sheet or a coated sheet produces the best results. The coated sheet is superior, however, to the super calendered sheet, inasmuch as there is less penetration into the paper. However, great care must be used in the selection of a coated stock. The coating should be hard but flexible, since the lacquer film will crack if the paper coating cracks.

In buying competitive lacquers the purchaser should obtain the following salient facts in order to evaluate them on a dollar-for-dollar basis:

1. Knowledge of what you want the lacquer to do
2. Weight per gallon
3. Percentage of solids per gallon
4. Specific gravity of solids or how far it will go per unit of thickness

Lacquers, in many cases, can be formulated to give the best results for certain types of protection. It takes much less lacquer to do the best job, if you select one specifically designed. Knowing the weight per gallon, the percentage of solids and the specific gravity of the solids permits a comparative evaluation of cost.

Coating impervious papers

by Robert Gordon

Frequently public demand for new developments has thrown the wheels of science into high gear—but often the wheels were forced back again into low or reverse by the slowness of the public to accept the very developments it originally demanded. Such paradoxes, although retarding, cannot stop progress. In many cases the backlog of technical information obtained through research has been dormant only because the public was not ready for it. New developments, which had been only in the laboratory stage until recently, have been put into practical use in packaging as in other fields.

For those who have been associated with packaging, it is not too difficult to recall the slow progress which protective coatings made in this particular field. The following discussion deals with some definite factors which must be taken into consideration before a good protective paper can be manufactured.

Creasing the coating

Let us view a horizontal sheet of paper with the top represented by line AB, and the bottom of the sheet represented by a line A′B′ as shown in position no. 1, Fig. 3. In this position, both lines are of equal length. When they are creased or folded sharply along a line equidistant from two ends, they will meet along a line 90 deg. from their original position, as indicated by position no. 2, Fig. 3.

The line AB, which may be considered as the coating, must increase in length in order to take up position no. 2, and becomes longer than the line A′B′ which may be considered as the paper, which was originally of the same length.

This change of length has a definite bearing on the imperviousness of the coating. In the first place, the greatest amount of stretch takes place at the fold. As a consequence, the protective film becomes thinner at the fold and will have a tendency to weaken there. If the coating is not elastic enough, it will not be able to withstand the stretch, and as a result it will break and allow penetration. If the side of the paper which is coated should break during the folding, a greater degree of elasticity of the coating is required because it has to stretch across the gap caused by the break in the stock also. The fragments of the paper breaking away from the body of the stock exert a force against the coating which may be too great for the stretched portion of the film to withstand, causing a number of ruptures along the fold line.

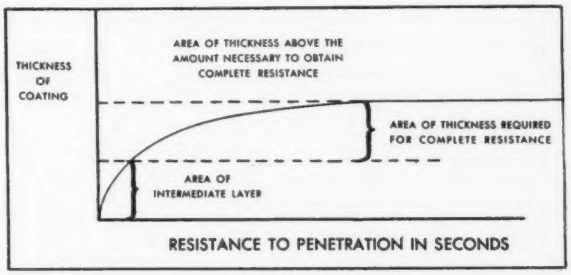
If we concern ourselves at this point only with the coating and forget the properties of the paper itself, we can show that the amount of coating in thickness applied is an essential part of producing a good resistant paper.

Components of coated stock

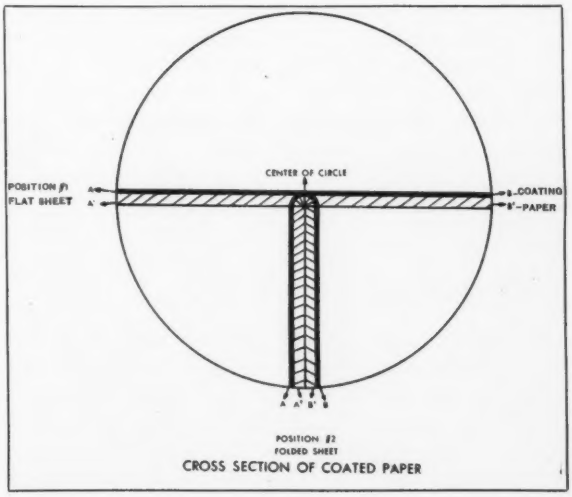
We can consider a coated stock as consisting of the following components (Fig. 2):

1. The area A which represents the coating
2. The line B, or the intermediate layer of coating
3. The area C which represents the paper

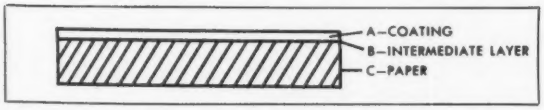
We can define the intermediate layer as that thickness of coating adjacent to the paper which must be applied



1—(Above) Curve of thickness vs. penetration resistance shows value limit to coating thickness.



2—(Below) The three components of a coated stock.
3—(Right) The effect of folding on a coated sheet. If the coating, represented in both positions by the line AB, does not have sufficient elasticity, it cannot withstand the stretch needed for a bend.





4—The heat-sealable lid for cylindrical container (left) will actually hold a vacuum. 5—Coated paper can be formed into this efficient container (center). 6—Box for petrolatum (right) is also of coated paper.

before it is possible for a flat coated sheet to develop resistance.

We define it as thickness rather than weight for the reason that the weight is secondary to the thickness in determining the qualities of the coating. As a good illustration, if we work with a paper which is absorbent, a substantial weight of the coating is absorbed before resistance starts, and if measured with a micrometer it will be seen that, regardless of the weight of coating absorbed, little or no resistance results until a definite thickness begins to register. This can be explained partially by the fact that the fibres themselves absorb the coating leaving little on the surface, and the coating tends to flow away from the high areas, leaving them bare.

As the coating starts to cover the surface of the fibres and fills the low areas to the level of the high areas, resistance starts to take place. This can be called the limit of the intermediate layer and any thickness in coating above this layer will show sharp increases in resistant properties. However, a point can be reached where any additional coating is of little value. This can best be illustrated by a general curve in which thickness of coating is plotted against resistance to penetration in seconds.

Elongation and bursting strength

In a previous paragraph we pointed out what occurs to a film of coating on paper when it is stretched by a fold. We also want to point out that the elongation and the bursting strength of a film are functions of the thickness and that, therefore, thickness of a coating which is applied to the paper is a factor which must be considered even though the elastic properties of a film may be very good.

Film will tend to break at the point of the fold where elongation is greatest, for at this point, due to the elongation, the film will be thinnest and the bursting strength will be less. As a result of the folding, the film will offer little resistance against breaking or puncture and it will rupture if it is not thick enough.

Because the thickness of the coating plays such an important part in obtaining the best results, any increase in thickness of a resistant coating to compensate for poor elongation and bursting strength may make such a coating prohibitive from an economic standpoint unless other means are taken to keep the cost down. The coating in most cases is more expensive than the finishes applied to the paper by the mills.

Essential requirements

From a cost angle, too much emphasis cannot be placed upon the necessity of obtaining a stock which has the essential requirements for coating. First, the paper must not be absorbent for, as pointed out, little benefit is gained from the coating which is absorbed by the fibres. Second, the coating should be flexible so that it does not break when folded, causing the films to break because of the greater force exerted by the additional elongation required of the coating. Third, the stock should be so bound that fragments do not break away when folded, causing ruptures in the fibres. Last but not least, the paper should retain these properties over a long period of time and not be subjected to too great a change under different climatic conditions.

Some new coatings

Not long ago, a "self-sterilizing" coating was developed to inhibit fungus and bacterial growth on such materials as cellophane, Pliofilm, metal foil and paper. This made practical the use of many materials for packaging and shipment of foods and other substances which are susceptible to attack and deterioration by such forms of life. The mycocidal and germicidal action of S-coating[1] is accomplished through application of adsorption compounds of silver on colloidal carbon. Aside from this coating, most of the new developments in coatings for packaging applications have depended upon developments of synthetic resins.

Outstanding advances have been made toward the perfection of dispersion type coatings. Work originating with the Bakelite Corporation, and since carried on by numerous industrial laboratories, has resulted in the production of high solids dispersions of vinyl chloride-acetate resins,[2] making possible the application of superior films at substantially reduced unit cost. Although the low flammability, durability and chemical inertness of vinyl chloride-acetate resins have been recognized for some years, application of these resins involved considerable expense due to the low solids attainable and the high cost of active solvents.

The principles on which the new dispersions, or organosols, are based are as follows: A finely divided resin powder is dispersed in a plasticizer in much the same manner as a pigment would be handled. Whereas some surface swelling or solvation of the resin takes place, its solution is not attained. For this reason, no question of solution viscosity or attendant stability problems (characteristic of solutions) result. The volatile constituents are chiefly nonsolvents and are used merely as carriers. It is possible to prepare these dispersions without any volatile carrier. Such 100 per cent solids dispersions are known as plastisols. However, for most coating requirements the organosol type, containing between 65 and 70 per cent of solids, has been found most useful.

Organosols may be pigmented in any shade desired, or may be applied as clears. It is customary to apply a light base coat first to minimize penetration, though this is not always necessary. When the volatile carriers have been removed by conventional drying means, it may be desirable to calender this base coat before applying the remainder of the coating if the stock has a rough surface and a high finish is desired. After the volatile carriers have been removed from the finished coating, a discontinuous deposit remains which must be fused for approximately 1 min. at about 350 deg. F. This fusion transforms the deposit into a tough, well-anchored film. Some slight deterioration in the strength of the cellulose fibres may result from a poorly controlled fusion operation, though in many instances this is more than offset by the gain in tensile strength from the applied film.

This method of coating is still too new to permit any accurate predictions as to how extensive its contribution to improved packaging may be. It seems quite well established, however, that in the application of heavy films, its advantages will outweigh the obstacles to be overcome. To what extent it will be satisfactory for use as a light film applied to lightweight paper stock is not now known. One outstanding application has been in the fabrication of heavy multi-ply wraps for overseas ordnance shipments. Conversion of this particular work from solution coating to an organosol dispersion more than doubled the unit output of one modern coating plant.

The average cost of organosol dispersions, based on film-forming solids, has been found to run approximately one-half that of equivalent solids carried in solution. This should be considered, together with the fact that the film deposited is of superior quality to that possible of attainment by other means.

Dispersion resins have been further developed in the newest addition to the Geon resins—Geon plastic latex[3]. The fundamental difference between the familiar Geon latex and the new plastic latex is that the former is a straight dispersion of a polyvinyl chloride resin to which a plasticizer emulsion must be added, while the latter is self-contained material, greatly facilitating the formation of uniform films and coatings. This is both because the plastic particles have greater adherence to

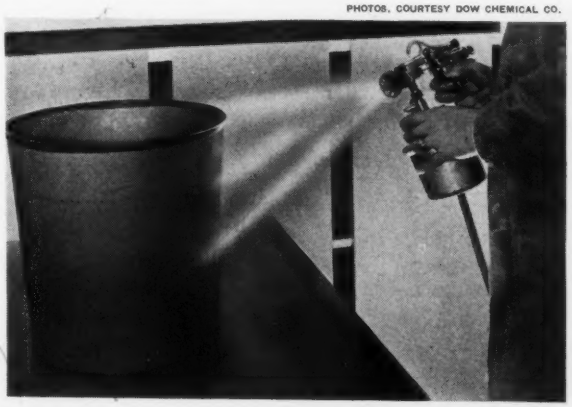
[1] The manufacture of, and the patents covering, S-coating are controlled by the Sterilite Products Co. The development of the packaging uses of this material has been conducted by the Shellmar Products Co. See Dr. Alexander Goetz; "S-Coating," MODERN PACKAGING, XVIII, No. 1 (Sept., 1944), p. 113.

[2] Vinylite organosols and plastisols. Justus Hoyt, "Organosols, A New Type of Dispersion Coating," MODERN PACKAGING, XIX, No. 7 (March, 1946), p. 193.

[3] A vinyl chloride resin latex manufactured by The B. F. Goodrich Chemical Co.

1—Spray application of film-forming resin coating to fibre container for protection and decoration.

PHOTOS, COURTESY DOW CHEMICAL CO.





2—Vinylidene chloride coating on these bags is tested to determine its resistance to chemicals.

each other upon deposition and because the plasticizer is an integral part of the resin, thus eliminating the possibility of selective absorption of plasticizer by the material being coated.

Two new coating materials of the Saran family[4] have been introduced. One of these is a solvent-soluble resin and the other is a latex. Among other uses, these coating materials are suitable for application to papers, films and foils. They are said to exhibit high resistance to a wide variety of chemicals as well as low rates of transmission of gases and vapors, excellent mechanical properties and fireproofness.

The Saran latex proves particularly useful as a film-forming coating composition in which water is the only dispersing and carrying phase. The latex is sufficiently odorless and tasteless to be suitable for application to protective food-packaging papers. It provides a convenient material for fabricating into hermetically sealed envelope-type bags for packaging greasy products of various types—potato chips, for example, or nutmeats. Corrosive chemicals and the like are safe if the package is lined with the latex coating.

The new Saran solvent-soluble resin is a definite departure from the usual type of vinyl resin. It is a copolymer of vinylidene chloride and acrylonitrile, which combination accounts for the unusual properties exhibited by coating compositions based on this product. Its manufacturer claims that, through its proper application, impervious coatings may be obtained which are completely waterproof and more moistureproof than any other organic coatings. One of the outstanding properties of the resin is its ability to form high solids viscous solutions which exhibit no signs of gelling on standing. Thus, solutions which do not require warming and agitating before use can be prepared and stored. There is no tendency for gels to form in application equipment. These Saran coatings heat seal easily and produce a bond which is as strong as the coating itself.

[4] Saran F120 and F122, Dow Chemical Co.

In a new spray coating technique,[5] used to coat large assemblies for corrosion prevention during storage, the soluble Saran resin is used in conjunction with Vinylite resins to form a primary web-coating to which further coatings of Saran latex and Vinylite resins are applied.

For improved high-gloss overfinishes for paper labels, etc., a maleic-acid-modified vinyl chloride-acetate resin is available. The overfinishes may be applied over a variety of inks and exhibit good adhesion characteristics. Baking temperatures for these modified resins need not be so high as those formerly required for finishes based on the unmodified resins. In some cases drying may be accomplished at room temperatures.

Some recent formulations employing oil-reactive ester resins[6] have proved useful in decorative coatings and overprint varnishes for paper. Because of their chemical resistance and stability, these products are suitable for use in coatings for bottle cap liners. Furthermore, the resin-treated oils may be utilized in printing ink formulations to which they contribute such properties as quick conversion, good color and adaptability to a range of viscosities.

Another recent development in functional coatings for paper is the Dri-Film process. In this process, paper is passed through a chamber containing a methyl silicone resin in vapor form. The resin is precipitated on the surface of the sheet through reaction with its residual moisture. Such a film is not continuous, however, and although the sheet exhibits resistance to water and oil, it is not impermeable to gas or to water vapor. It is scuffproof but tends to be brittle.

Good promise in the field of coating compositions has been shown by a new type of polyamide (nylon) resin[7] originally developed by the Northern Regional Research Laboratory. The band of solvency for the new resin is very narrow. While this is a challenge to formulative ingenuity, it means that once the material is formed into a coating, resistance to solvent hazards is high. In addition, the resin exhibits low flammability, and resistance to mild acids, mild alkalis, hydrocarbons, oils, greases, gasoline and aqueous systems. When the resins are used with paper, metal foils and cellophane for heat sealing, the bond is generally stronger than the materials which are being sealed. The resin heat seals at temperatures lower than those commonly used, and will not block at room temperature. The lower temperature permits manipulation with less danger of weakening the paper. Tests so far conducted indicate that no toxic effects are produced. This new polyamide resin should prove useful in packaging applications such as coated papers for protective packaging of foods, heat-sealing envelopes, pressure-sensitive adhesives and in hot-dip stripping compounds.

[5] Technique developed by Dr. William H. Holst and G. Russell Hersam of Butler and Company. The coating compounds used in this technique are manufactured by the R. M. Hollingshead Corporation. See "A Spray Coating for Heavy-Duty Packaging," MODERN PLASTICS, XXIII, No. 8 (April, 1946), p. 152.

[6] C-9 resins, Bakelite Corporation.

[7] Norelac Northern Regional Research Laboratory and General Mills' Polyamide Resin Series ED. A. G. Hovey, "Polyamide Resins," MODERN PLASTICS XXII, No. 9, (May, 1945), p. 125.

Developments in waxes

Petroleum waxes are the backbone of waterproof and moistureproof papers. With few exceptions, they are among the best nonmetallic materials known for resistance to transmission of water vapor.

They coat paper milk containers, butter cartons, bread wrappers. They protect cheeses, frozen foods, dehydrated foods, meats, crackers, tea, coffee, chewing gum, cigarettes and candy. They protect machine parts from corrosion.

Attention was focused on waxes during the war period because of their role in paper packaging taking the place of steel, tin foil and other materials not permitted except for the most essential uses.

The present use of waxes in packaging is the result of years of development that goes back as far as the first waxed papers used by National Biscuit Co. at the turn of the century for the inner wrap of their Uneeda Biscuit package, which took crackers out of the cracker barrel and put them into individual consumer packs. It goes back to the early wax-dipped inner wrap for Cracker Jack. These same waxed packages with certain improvements are still used today.

To understand the use of wax treatment of paper, one must first know something about paper. Paper consists of countless cellulose fibres felted together and bonded by a sizing to make a continuous contact of cellulose to cellulose throughout the sheet, with minute openings between the fibres. Water (liquid) will pass through these interstices, rather than along the fibres. Moisture (water vapor) on the other hand, is transmitted by the cellulose fibres as well as through the interstices, since the cellulose fibres are hygroscopic and can actually remove any moisture from the surrounding air.

Paper may be made watertight by filling up the minute openings between the fibres with wax. This may be done in the paper industry by what is known as *drywaxing*—driving the wax into the paper with little, if any, wax remaining as a surface film.

This method, however, though it fills the pin holes with wax, does not completely cover the cellulose fibres and many protrude above the surface like "fuzz" or wicks which absorb the moisture from the more humid side of the sheet and carry it along the chain of cellulose fibres to the dry side. Dry-waxing, therefore, is not capable of producing a completely moistureproof sheet. This can be done, however, by *wet-waxing*—or applying the wax as a surface film, with only enough wax impregnated into the paper to provide a bond to it.

A third method of imparting both waterproofness and moistureproofness to paper is usually effected by laminating two sheets of paper together with a layer of wax. This provides a continuous barrier protected from careless handling or abrasion.

The wax film may be part of the carton structure as an outside or inside coating, or as a laminant. It may be used in a liner or as a wrapper. No fixed rules can be established for the type of package to be used for a specific application without careful study of the factors involved and a determination of the combinations best suited to each case. However, one objective must be maintained and that objective is—a sturdy continuous wax film.

Types of petroleum waxes

Petroleum waxes used in the packaging industry are of two types—paraffin waxes and microcrystalline or amorphous waxes, as they were called before their minute crystalline structure was known. While they are both composed of paraffinic hydrocarbons, they are quite different in their physical characteristics.

While both of these waxes are products of petroleum refining, their difference is due to the fact they they are separated from entirely different fractions of crude petroleum.

Paraffin wax is removed from distillates or overhead stocks by sweating or solvent separation. The microcrystalline grades are separated from residual stock by separating the petrolatum from these stocks by centrifuge or solvent separation and then further treating the petrolatum by selective solvent separation or by recentrifuging the petrolatum.

As microcrystalline waxes thus removed are dark in color, it is necessary in some cases to decolorize them in varying degrees to meet the requirements of specific uses. Very little difference is found in different shades of the same microcrystalline wax.

Paraffin waxes have lower boiling points than the microcrystalline waxes and are therefore lower in molecular weight, a fact which probably accounts for

1—Wax-coated fibre cans with metal ends, filled and closed by special machinery, for frozen foods.

PHOTO, COURTESY CONTINENTAL CAN CO.





2—Big user of waxed papers is 2½-billion-dollar-a-year baking industry. A & P dated wrappers.

the melting point range of paraffin wax being lower than the melting point range of microcrystalline waxes.

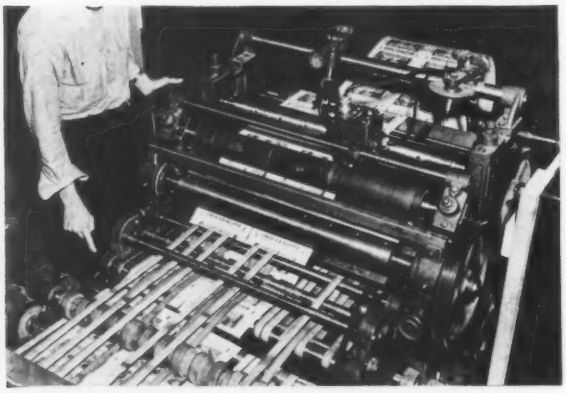
Under ordinary circumstances it is found that paraffin wax melts between 100–150 deg. F. and has a refractive index of approximately 1.43 at 75 deg. C.; microcrystalline waxes, on the other hand, vary in melting point between 140–200 deg. F. and have a refractive index of approximately 1.45 at 75 deg. C.

There are, however, waxes of both types which do not fall within these limits due to novel methods of manufacture or to idiosyncracies of the crude oil.

The different melting point grades of both petroleum waxes are made by adjustments in the manufacturing process and are also due to the nature of the crude oil which is being run.

3—Wrapping machine for butter wraps runs them through hot wax, laminates, cools, scores and cuts automatically and with push-button control.

PHOTO, COURTESY F. B. REDINGTON CO.



Important properties

The important properties of petroleum waxes are their high resistance to water-vapor transmission, their practical freedom from odor and taste, their change from solid to liquid state over a very small range of temperature, their relatively low viscosity in a liquid state immediately above their melting point and their chemical inertness. In addition to these properties common to both waxes, microcrystalline grades have excellent adhesive qualities, are quite flexible in thin films over a wide range of temperatures and are characterized by high melting points valuable for certain purposes.

On the flat sheet there is very little difference between the water-vapor transmission rates of paraffin and microcrystalline waxes, but the latter are said to be superior on a creased sheet or one that must stand crumpling or rough handling during its protection period. The property of microcrystalline wax is obviously due to its flexibility in thin films whereas the paraffin is quite brittle.

Commercial wax papers are being produced which have water-vapor transmission rates as low as 0.2 g. per 100 sq. in. per 24 hr. at a temperature of 100 deg. F. and a relative humidity of 95 per cent on the wet side. Through further research and improved methods of application these rates are now being continually reduced.

Adhesive properties or tackiness of microcrystalline waxes make them valuable as laminating agents when the adhesive layer also serves as a water-vapor barrier. Many of the ordnance wrapping materials used during the war employed this particular property of microcrystalline waxes.

Paraffin-type waxes and microcrystalline types may be combined with one another in all proportions, so that compromises in the form of blends are possible. This was fortunate, when Army Ordnance and the Quartermaster Corps were demanding the lion's share of microcrystalline for the laminations and wax dips used for packing ammunition, metal parts and rations. The Quartermaster Corps used a combination of paraffin and microcrystalline for the wax dipping of ration packages, but also made considerable progress in developing new wax compounds with less microcrystalline and including paraffins mixed with synthetic thermoplastic compounds. Future progress will undoubtedly be made in this field. Microcrystallines were advantageous for military packaging because of their higher melting points, and because of their greater ductility which prevents chipping at low temperatures.

Petroleum waxes in themselves do not provide greaseproofness. Greaseproof properties are a function of the sheet and not of the wax treatment. Glassines, parchments, cellophanes, for example, are greaseproof

in themselves, before the application of wax and not because they are treated with wax.

"Blocking" is a term used by the paper converting trade to describe the condition wherein two waxed surfaces have flowed together to produce a union between them. Various degrees of blocking are experienced, from the incipient fusion in which only the surfaces are marred slightly, to the condition in which a cake or block of wax results. Blocking is caused by excessive temperature, time or pressure, either alone or in combination with one another. Blends of paraffin waxes and microcrystalline waxes, it is said, can be prepared which have no greater blocking tendencies than fully refined wax.

Production and application of waxes

Total American production of waxes in 1945 has been estimated to be in the neighborhood of 820,000,000 pounds. A large percentage of this is being used for packaging purposes.

Wax may be applied to paper in the following ways:

1. Wax may be applied as an emulsion in the beaters at the paper mill.
2. It may be used as a coating to paper or paperboard, on one or both sides, by roller method.
3. The entire paper sheet or board may be immersed in a wax bath.
4. Dacca method: Cartons of properly selected stock may be glued on one end, then immersed in a molten wax compound which coats both inside and outside of the container. The container is then dried in a hot chamber to give a thin uniform coating and may be heat sealed.
5. Single-dip method: Sealed and filled carton is immersed in a molten bath. Extreme care must be taken to have container completely sealed before immersion, so that no wax flows into filled package.



PHOTO, COURTESY WESTERN WAXED PAPER CO., DIV. OF CROWN ZELLERBACH CORP.

4—One-sheet waxed package permits single servings without tearing; reclosed, package reseals itself.

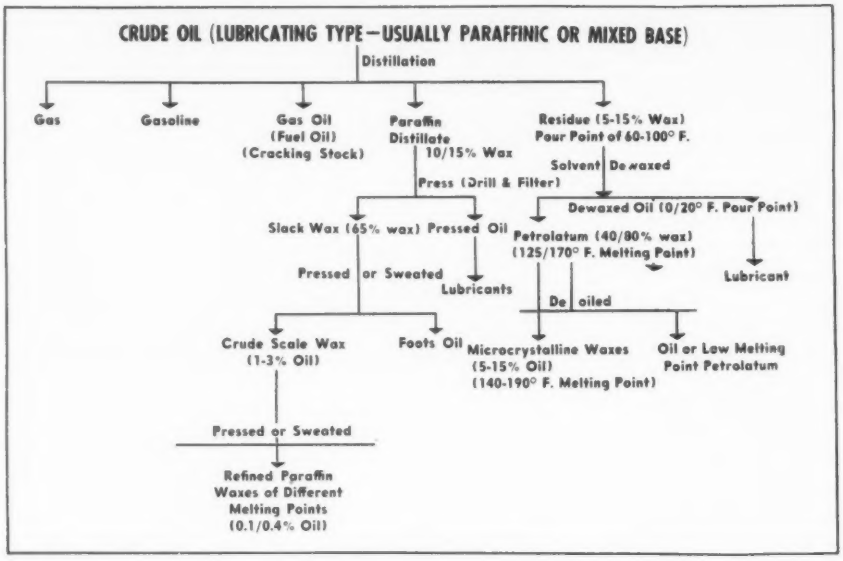
6. Application may be made by flushing-type machines such as the "enrober" or some machines designed for the special purpose of coating milk containers.
7. Double-dip method: Properly filled and sealed container is given a first dip to impregnate the board to a controlled distance, then is followed by a second dip to give a smooth, hard, continuous coating. Same compound is used for both dips, but is kept at a higher temperature for a shorter time during the first operation and at a lower temperature for the second dip. Machines for this operation have been widely used for wax dipping many types of rations and ordnance materials.
8. Two films may be laminated to each other with a wax adhesive.

Use of waxes

Paraffin waxes have been used for hundreds of purposes in the food field for many years. Among the important wartime developments were the blends of



5—Bread wrappers and paper milk containers are among the most common examples of the wax-treated packages which are illustrated here in a representative collection. Lard cartons, paraffin-waxed outside to repel water and prevent stains, have a liner of greaseproof paper.



6—Simplified diagram indicates the derivation of petroleum waxes. Note different processes by which paraffin waxes and microcrystalline waxes are obtained.

microcrystalline-type waxes for dipping ration packages and for ordnance wrapping of metal replacement parts to prevent development of corrosion.

The double-wax dip method, used so widely for Ration K, has also been adopted for the packaging of California dried fruit for export.

This same method was employed for the packing of 0.50-calibre aircraft ammunition. According to this method, 0.50-calibre cartridges were packed 60 to a container, four containers making up the load in the wooden box which was shipped. After the ammunition-filled metal link belt was loaded into the individual, heavy paper container, the top of the box was sealed automatically. Then it passed along a conveyor where the box was inspected for breaks. After inspection, the container got its first bath in molten wax heated to 200 degrees. A few seconds later it was immersed again, this time in a 188 deg. bath. After the second immersion, khaki belts were placed around the individual containers. These straps were used in unpacking, since the containers were packed so tightly in the metal-lined wooden box that in the absence of this aid it would have been impossible to remove them without damaging the containers.

7—Wax coated cups adapted for packages of frozen coffee. Cups in carton are overwrapped with cellophane.

PHOTO, COURTESY SHELLMAR PRODUCTS CO. AND DIXIE CUP CO.

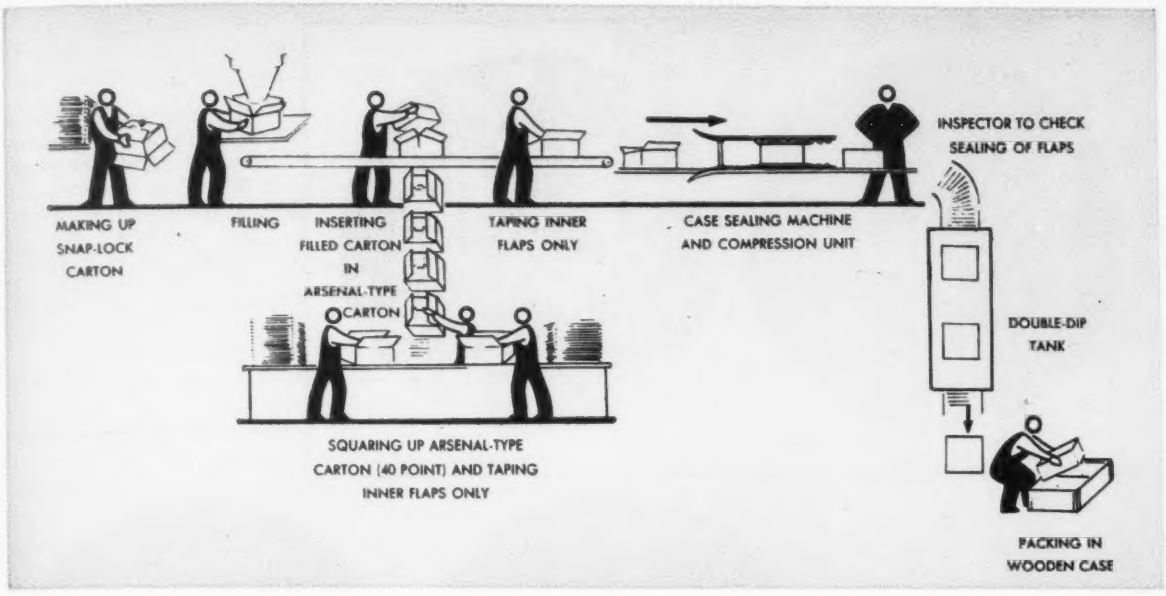


The double-dip wax application for this ordnance wrap was the same in principle as that used for the wrapping of Army 10-in-1 rations. Cartons for this food unit were made on standard folding box equipment. Paperboard employed had to be carefully chosen. It needed sufficient strength, and had to be finished in such a manner that the wax of the first bath penetrated 40–60 per cent of the board. Cartons had to be securely sealed so that no wax entered the package and so that there was no chance of the wax film being broken at the edge of the tabs. Ends were designed so that it was possible to obtain and maintain a continuous film of wax. Corners had to be carefully matched to leave no holes over which the wax film was forced to "bridge" itself. Wax film is in itself structurally weak and requires the support of paperboard.

Packages were taken off the line at regular intervals, say one in every thousand, and tested for their ability to stand up under prolonged storage conditions, rough handling and submersion. In these tests they were subjected to +140 deg. F. for 24 hr., to −60 deg. F. for 24 hr., to drop tests and submersion for a continuous period of 24 hr. under a 6-in. head of water.

In most instances double-dip waxing equipment has been removed by the Government from civilian plants. The urgency for the double-dip waxing method in the packaging of rations and ammunitions is over. The companies who did this type of packaging under Government contract, however, are especially enthusiastic about the fund of knowledge gained in wax treatment learned as the result of war experience.





8—The waterproofing of packages is an essential factor in safe, protected shipping, particularly when merchandise is to be exported. Schematic drawing illustrates double-wax-dip procedure of waterproofing.

Many say they are adapting this knowledge to civilian production, particularly for export packaging where such added protection is required.

Further developments

A development in a wax-waterproofing machine at the Franklin Baker plant of General Foods was described as follows by F. L. Bryant, chief engineer:

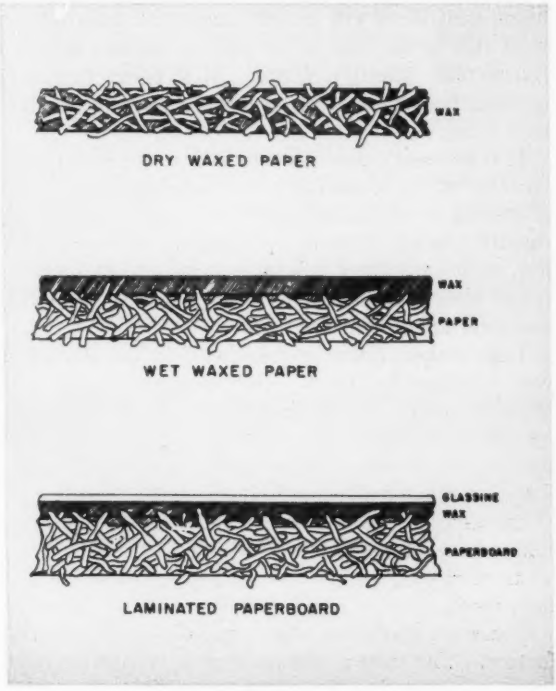
> There were a number of methods proposed for wax impregnating and coating of the various ration packs supplied to the Army, but our experience in 1942 led us to the conclusion that the packages should be drained in an angular position so that the residual wax would flow to one corner and thereby eliminate the accumulation of wax which inevitably occurs when the packages are permitted to drain to an edge.
>
> The method of wax application was studied and an *enrobing* action gave the desired penetration on the first pass with three sets of nozzles and the proper film thickness on the second pass with two sets of nozzles. In both the first and second pass the packages are carried on specially designed carriers that hold the packages so they will drain off at one corner and the nozzles are arranged so that they flood from all four sides, thus ensuring complete coverage.
>
> The machines are equipped with Viking pumps of 55 g.p.m. capacity, the excess wax draining back to a sump tank under the machine where it is strained before passing to the pump suction for recirculation. This sump tank is equipped with an automatic temperature regulator and an automatic recorder.
>
> This whole arrangement makes possible very close control of wax temperature necessary for proper penetration and coating.

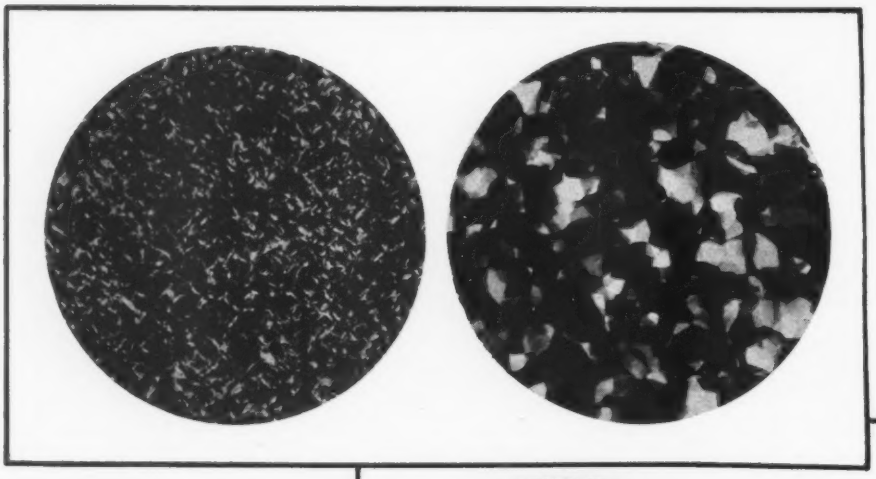
Wax coatings on metals

In addition to their uses for waterproofing and moistureproofing all types of papers and paperboard containers, including fibre cans with metal ends, petroleum waxes have also been used for coatings on metal. The prewar beer can, for example, was lined with a petroleum wax lining. Since tin is scarce, there is much interest in wax coatings for collapsible tubes.

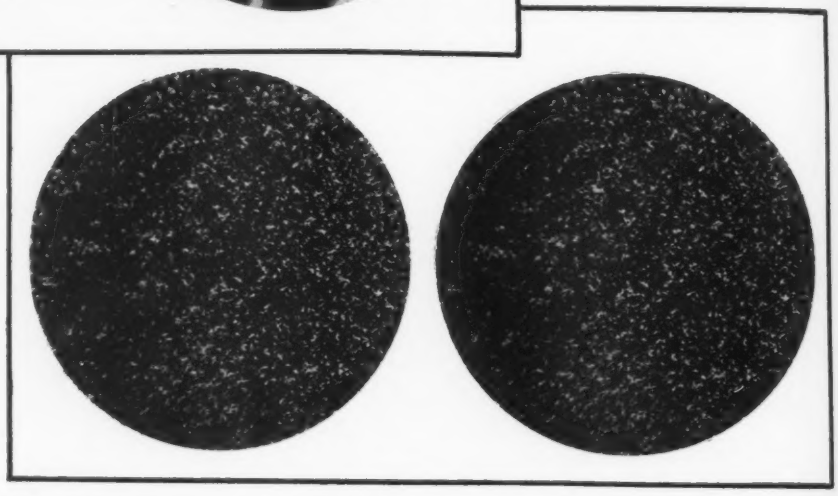
Lead is the only substitute for tin in collapsible tubes

9—In dry wax method, protruding wicks absorb moisture. Wet-waxing effects moistureproof sheet, as does lamination of paper plies with wax layer.





10—Paraffin wax seen by microphoto. Left: before aging. Right: after aging. Note the changes in crystallization which render paraffin wax unsuitable for a number of purposes requiring the property of stability.



11—By comparison, microcrystalline waxes differ from the paraffin type in that they are relatively stable and show practically no change in crystallization before (left) and after (right) similar time tests.

at present. Obviously it is essential that contents of collapsible tubes be protected from lead exposure. Most dentrifices will absorb some lead from contact with this metal, and lather shaving creams absorb a considerable quantity of lead. Most products with an aqueous base will absorb lead when packaged in bare lead tubes.

It is necessary, therefore, to find an internal protective coating for collapsible tubes containing lead. Such a coating must be noncritical in supply, easily and rapidly applied, uniform, inexpensive, nontoxic, odorless, chemically inert, insoluble in water, have melting point above usual storage temperatures, flexibility and good adhesion to lead surface.

Tube makers differ in their belief in the efficacy of wax coatings for tubes. One company states that after six years of experiment they have no general statement to make because wax compounds differ so widely for various products, as does equipment used for this purpose by various manufacturers.

Another maker has had some success with microcrystalline base waxes melting at 155–190 deg. F. Some of these waxes, modified with synthetics, have also been used.

Waxes are applied as a final operation in tube manufacture. The tube is placed over a vertical mandrel having an actuating pin on the top. When the tube is pressed down on the pin, hot wax from a pot beneath the mandrel is pumped out through the top of the mandrel, flushing the tube. This cleans and coats the interior of the tube simultaneously.

The tubes are placed on fluted cones attached to a conveyor which carries them through an oven heated about 40–50 deg. above the melting point of the wax. Thus excess wax is drained off. The waxed tubes are then packed, ready for shipment.

New developments in waxing collapsible tubes have been largely confined to using substitutes for the particular microcrystalline waxes. However, Government demands on these during the war made them scarce and more attention was paid to improving the quality of other possible coatings.

Nearly all dentifrices and lather shaving creams have been packaged in wax-lined collapsible tubes since the WPB tin order went into effect. Some cosmetic and pharmaceutical preparations have also been packaged in wax-lined tubes. A comparison of lead absorbed by the contents of unwaxed and wax-lined collapsible tubes published in the *Journal of the American Pharmaceutical Association* (Vol. 32, 1943) showed a significantly lower absorption of lead for those tubes which had been coated with wax.

Postwar uses of waxes for tube linings, most authorities feel, will depend on the availability of metals for

tubes. Some believe there will be little relief in the tin situation for a long time to come. If this is true, then it may be an additional packaging use for microcrystalline wax.

Thermoplastic coatings

Much is being said these days about thermoplastic coatings. Basically, these are made from blends of various waxes which are combined in various ways with nonwaxy materials to produce a strong, tough, film-forming product resistant to the passage of moisture. Makers say true thermosplastic coatings are a homogeneous product throughout the operating range of their use and they do not separate, stratify or throw out in the melting tanks.

In these characteristics, they are said to be different from blends of waxes that do separate, stratify or throw out some of the added ingredients. They rely on a fibre or other base for their structural strength. They vary from hard nonblocking films to soft permanently plastic films.

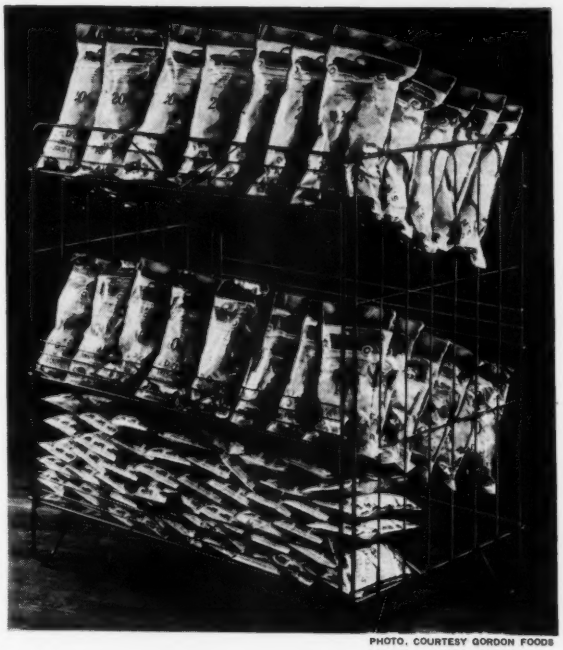
Most are sealable with heat and pressure. For foodstuffs they are odorless, tasteless and nontoxic. Their melting point varies, depending upon the tasks they are to perform. Application may be made by substantially the same methods as are used for applying other wax coatings. (See discussion under "Production and Application of Waxes," p. 603.)

These thermoplastic synthetic compounds combined with paraffin are used widely for many packages to take the place of microcrystallines. They were used on several types of ration packages and on ordnance packaging for small arms. They are protecting such hygroscopic products as powdered eggs.

Before the war, thermoplastic coatings were adopted by Quaker Oats for their small individual pack and by Standard Brands for Diamalt, Honor Brands for frozen foods. New uses are for Friend's baked beans, A. A. Walter Co. dehydrated soup and for a number of other such products.

Cellophane cheese wrappers to take the place of foil have been successfully moistureproofed by these thermoplastic compounds. They may be used as laminating adhesives.

Laboratory tests showed that boxes made from patent-coated news stock, coated either outside only or inside-outside, provided water-vapor resistance in the finished package under 0.10 g. per 100 sq. in. per 24 hr. at 100 deg. F. and 90 per cent relative humidity using anhydrous calcium chloride as a pack.



PHOTO, COURTESY GORDON FOODS

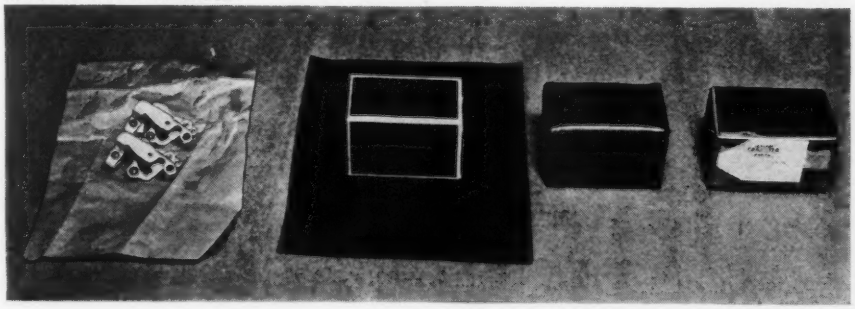
12—Wax-coated glassine paper is an ideal material for greaseproof food wrapper with sales appeal.

Petroleum waxes are among the oldest materials for imparting water- and water-vapor resistance to packages. As packaging has become more complex and requires higher levels of protection, appearance and quality, the petroleum industry has kept pace with its research and with production demands.

This program has been in two directions: first, in improving the commercial grade of wax and finding new grades and mixtures for special purposes; second, in finding material from other industries to combine with waxes to impart unusual properties of strength, film forming and water-vapor transmission which are so necessary in order to ensure the required sound packaging protection.

Future progress will unquestionably be made in the second direction. Chemical research as exemplified by the plastics industry will produce many new synthetics for packaging use.

PHOTO, COURTESY FOREST PRODUCTS LAB.



13—Wartime Method 1A pack utilized wax coatings. Illustration shows part coated with preservative; wrapped in grade A greaseproof paper; cartonized; in grade C greaseproof paper. After sealing, carton is wax-dipped.

Uses of asphalt

The familiar 2-lb. canister package for table salt is laminated with asphalt to give protection against moisture. It is one of the commonest uses in consumer packaging of one of the oldest known waterproofing materials—so old some historians claim that Moses' basket in the bulrushes was waterproofed with natural asphalts removed from some of the asphalt lakes of the Middle East.

The critical supply of petroleum waxes for war uses created a demand for every type of waterproofing and water-vaporproofing material. Asphalts could be used for many purposes in place of waxes and thus received wide attention for packaging purposes during the war period. They also have valuable adhesive properties.

The low cost of asphalt (about 1 cent a pound) in comparison with paraffins and microcrystalline waxes (5–14 cents a pound) as well as the abundance of this material, are other important considerations.

Uses of asphalt in packaging

Asphalt has been used for years by paper producers as a laminating material for multiwall bags and for the liners of textile bags. The first patent on this subject was U. S. No. 361,050, issued April 12, 1887, to W. H. H. Childs for duplexing paper by cementing two or more layers of paper to each other by the use of asphalt.

The war greatly intensified the demand for asphalt-laminated papers used for the walls of solid fibre containers to ship military foods and equipment, and as an outside lamination to waterproof paper containers which hold motor oil, paints, printing inks and similar products. It has been employed for waterproof flexible films combined of kraft, metal foil, cellulose acetate, cellophane and other materials, and for treatment of sealing tapes. Asphalt was used as a coating material by many shippers to waterproof the seals of containers for overseas shipment.

Asphalt or bituminous emulsions for the waterproofing of paper were first made in Europe about 40 years ago, but the use of such substances in watery mediums for the treatment of paper has also received wider attention since the beginning of the war.

One of the most important present-day uses of bituminous emulsions is in the form of sizing applied to multicylinder boards, subsequently used for laminating V-type waterproof containers. The advantage of such applications, it is said, is in the increased amount that can be added to the sheet to attain exceptional degrees of sizing which is reflected principally in wet strength by Mullen bursting tests after progressive periods of immersion.

Bituminous emulsions have also come into promi-

1—Protek-Coat asphalt spray coating, applied over a light film of plastic, helps prevent corrosion.



2—Combination of coatings, show in Fig. 1, ensures low water-vapor transmission. Coatings strip easily.



nence as low-cost extenders for starches, the more expensive urea-formaldehyde resins and other materials now being used in weatherproof laminating adhesives. Such emulsions are entirely different from those used as a size. The basic bitumen is of a tacky nature and the emulsion is a fine dispersion, made stable to the heat and the acids required for catalysis. One of the recent findings in regard to this emulsion-starch-resin glue line, it is said, has been the reduction in corrosive action on tin cans. It is believed that this is due to the reduction in quantity of resin and catalyst used, which presumably are factors in the corrosion problem.

Low-cost adhesive types of bituminous emulsion are also now serving as successful extenders of polyvinyl adhesives. The bituminous emulsion is added directly to the finished cooked polyvinyl adhesive.

Because of all these increased applications for asphalt constituents, great strides have been made in methods for handling such materials and more is being learned daily about the physical characteristics and properties of the unlimited varieties of asphalt compounds.

A wider use of asphalts in packaging before the war, producers of these materials now believe, was retarded by lack of knowledge of methods for handling asphalt and its application. Of necessity, the war has meant considerable development in this direction and makeshift methods of application devised to meet the emergency needs of that time have pointed the way to greater refinement.

One chemical company, for example, producer of the dehydrating agent silica gel, sensing the need for certain new products to meet such requirements, perfected three "custom-made" asphaltic compounds for export packaging.

One of these is made for forming moistureproof barriers and is applied by spray coating. It has a base of high-quality, air-oxidized asphalts blended with inert fillers, solvents and plasticizing agents, is quick-drying and provides a tough, flexible coating said to give good performance over wide ranges of temperature.

The second is a heavy-bodied, asphaltic compound applied in a ribbon 1-in. wide by 1/8-in. thick, recommended for moisture- and waterproof seals on all types of waterproof paper. This is said to fill all openings and channels along the seals and closures of all types of waterproof papers. The compound can be applied with caulking gun or by a flow gun fed from a pressure tank or motor-driven barrel pump.

The third of these materials is produced by oxidizing products derived from the steam distillation of a specially selected crude petroleum and is recommended as a crate-top coating applied by spraying or by squeegee, rake or trowel for small operations. An asbestos filler is used to add body and bridging ability.

To many producers of asphalt specialties, the use of asphalt for packaging represents a sizable part of their business. One company said that about 33 per cent of its sales covered orders for asphalts for packaging purposes.

The American Society for Testing Materials defines



PHOTO, COURTESY AMERICAN CAN CO.

3—Asphalt-laminated fibre offers protection in the 2-lb. canister package for Worcester Ivory Salt.

asphalts as "black or dark brown solid or semisolid cementitious materials which gradually liquefy when heated and in which the predominating constituents are bitumens all of which occur in the solid or semisolid form in nature or are obtained by refining petroleum or which are combinations of bitumens mentioned with each other or with petroleum derivatives thereof."

Native asphalt formations have been known since antiquity and were used quite widely as waterproof materials. They were found as crusts on asphalt lakes in various parts of the world. Largest of these are the natural asphalt formations in Trinidad. These asphalts, however, because of their high softening point are not suitable for packaging purposes.

Late in the nineteenth century, it was discovered that asphalt was a constituent of certain petroleums and could be recovered by distilling off the volatile oils which hold it in solution. Today more than 80 per cent of the world's supply of asphalt is produced at petroleum refineries either by distillation or oxidation.

It is delivered to the user in solid form in blocks that may be melted on the premises or in liquid form by heated tank cars or trucks. Delivery in liquid form is advantageous to the large user, since the hot asphalt may be pumped directly from tank car or truck into the user's plant with less handling. This requires less time and heat to raise the temperature again to the correct degree for application. Tank cars and trucks are usually heated by steam, circulating oil, or chemicals and are so insulated with rock wool or other materials that the temperature of asphalt shipped, say, at 500 deg. F., does not fall in transit much below the correct temperature for application on arrival.

Asphalt has many of the desirable waterproofing properties of waxes in addition to adhesive qualities, depending entirely upon the grades selected. The number of grades and blends is practically limitless.



4—Efficiency of foil-wrapped packages can be improved by dipping in Protek-Film asphalt compound.

Differences are due both to the various geographic locations from which the petroleum is obtained and to processing and blending with other materials. Asphalts are sold by grades differing chiefly in softening point, penetration, viscosity, flash and fire point.

The American Society for Testing Materials has established standard tests for determining softening point, penetration, viscosity, flash and fire point of asphalts. These tests are used in selecting proper grades peculiar to each application.

Asphalts are hard, brittle solids, easily fractured at low temperatures. Upon warming they become progressively softer. The softening point, a term more accurate in describing the liquefaction of asphalt than melting point, is determined by the "ball and ring" procedure. The softening point is recorded at the temperature required for a cake of asphalt to soften sufficiently so that a ball resting upon the asphalt is forced through the standard ring. Penetration is measured by the depth a steel needle will pierce a cake of asphalt at a given temperature, when the needle, weighted with a specified force load, is free dropped on the asphalt. Viscosity is measured by the amount of time required for a specified quantity of asphalt heated to a certain temperature to pass through a Furol tube into a receiving flask.

5—Research has proved that cans fare better in weatherproof fibre containers with asphalt barriers.



Important factors to be considered for asphalts used in paper laminations and coatings are pliability, staining, adhesion and cohesion. The asphalt cannot be so brittle that it will crack at low temperatures, yet a grade that may be flexible at low temperatures may have at the same time a softening point so low that the asphalt will liquefy at temperatures too low to be suitable for use in packages shipped to tropical climates. On the other hand, a grade that will have sufficiently high softening point for tropical temperatures may be so brittle that it is impractical for packaging purposes.

Viscosity is another factor which must be controlled to give the hot asphalt fluidity for proper spread over the paper surfaces at the temperature applied. Flash and fire point must be considered from the standpoint of fire hazards in the plant of the user.

Softening points of asphalts may be as high as 350 deg. F., but for paper packaging they are usually in the 140–200 deg. F. range. They usually flow readily at a temperature about 100 deg. F. above their softening point.

The thermal properties of asphalts are different from those of petroleum waxes, which have sharp melting points and low viscosities. This complicates their use in packaging. They are miscible with petroleum waxes and petrolatum to a limited extent. The quantities of these materials which can be blended depend upon the nature of the asphalt. For the grades normally used in packaging, the upper limit of solubility is between 25 and 30 per cent of the additive. Above these percentages, it is said, a two-phase liquid system results, which remains separated even after cooling.

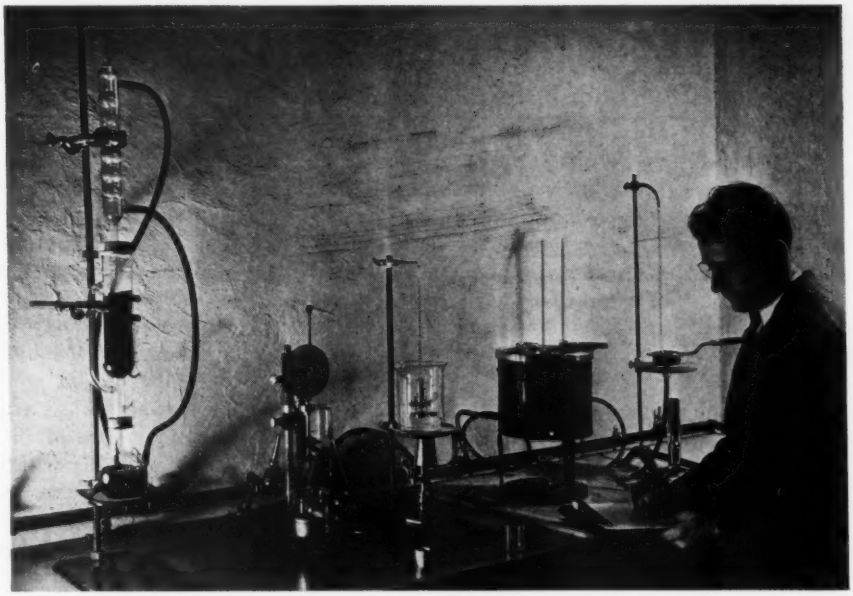
Because of their fluidity in molten conditions, waxes and petrolatum blended with asphalt reduce the viscosity of the asphalt appreciably with little effect upon the softening point. This permits application temperatures to be lowered as much as 25 deg. F. Second, they plasticize the asphalt at low temperatures and may help to prevent fracture under these conditions. This is particularly true of petrolatums which may increase the useful range by as much as 35 deg. F.

Testing asphalts

Findings of the past few years indicating that corrosion of cans was less in V-boxes using asphalt barriers than in V-boxes laminated with other materials, and the subsequent Army requirements that such boxes be provided with 1 or 2 barriers of asphalt have made it more important than ever for boxmakers to have information about the properties of asphalts.

At the request of some 15 makers of weatherproof boxes, the Container Testing Laboratories installed a year or two ago complete facilities for the testing of asphalt. The purpose was to provide an independent source through which boxmakers could have tests made of various grades of asphalt. Formerly they had to rely entirely on asphalt suppliers for such information.

XUM



6—End uses for asphalts are determined through tests. In the Container Testing Laboratories, a variety of equipment is installed for testing extraction, penetration, softening point, viscosity, flash point and other properties.

Apparatus installed for this purpose includes equipment for making tests of softening point, penetration, viscosity, flash and fire point and an extraction test by which it is possible to determine the quantities of asphalt required for laminating, per sq. ft. of board.

Wartime jobs and postwar prospects

Most wartime applications of laminating asphalts have been for shipping container board or for kraft papers for multiwall bags and flexible films such as creped kraft liner materials. However, asphalt has been used to some extent for lighter weight paper laminations. Experiments have been made in this field for cigarette wrapping papers to take the place of foil. Where eye appeal is important and where absence of odor is important, asphalt, however, has limitations. Its dark color is unsuitable for many purposes and the difficulty of applying it to a thin sheet without having it bleed is also a hindrance. Many asphalt enthusiasts believe, nevertheless, that certain constituents of asphalt may eventually be used which will eliminate all color and odor.

In what manner this can be accomplished without taking away some of the necessary properties, however, is questionable. It is the combination of the asphaltines, resins and oily constituents of asphalts which gives waterproof and adhesive qualities.

When tin was forbidden for Army biscuit cans, it was necessary to find a new waterproof container and find it quickly. The difficulty was in finding a satisfactory seal for weatherproof containers. After five months of experimentation, one company[1] developed what was called an Aquaproof seal—a fibre container which had all ends and seams dipped with molten asphalt.

The procedure for accomplishing this Aquaproof seal was carried out in the following manner:

[1] The Loose-Wiles Biscuit Co.

Twenty-four 1-lb. cartons of Type C square ration biscuits, wrapped in wax paper, were placed in a weatherproof fibre container. Inside the end flaps, a piece of loose weatherproof fibreboard was inserted directly over the biscuit cartons. The carton then went to an asphalt sealing line.

First one man, using a brush, applied the asphalt heated to more than 300 deg. all over the flaps, edges and corners of one end of the box. Then he closed the box with hand pressure, turned it over and passed it on to a second man on the line. This man went through similar procedure for the other end of the box. The third man dipped the edge of the box with the manufacturer's seam through a V-shaped trough containing a continuous flow of asphalt. Each end of the carton was again dipped in asphalt to a depth of two inches so that both ends of the box were completely covered with the substance.

A strip of 60-lb. kraft paper, impregnated with 25 lb. of asphalt per ream, was placed over the side seal, and square pieces of the same material were placed over each end like a cap to facilitate handling and to prevent blocking. Then two such boxes were enclosed in a larger container and similarly treated.

Equipment used for this sealing included a standard asphalt melting unit and vats on the line made from discarded dough-batch mixing units. Gas units were installed under the vats to keep the asphalt at the proper temperature.

A check revealed that the company used this same method of applying an asphalt seal throughout the war period. Whatever the future holds, however, this procedure is an outstanding development in methods of handling molten asphalts. Hundreds of inquiries have been received from other companies seeking information concerning this method. Undoubtedly the knowledge gained will be applied to improved civilian export packaging in this field.

XUM

Applying thermoplastic coatings

by Robert J. Gray

Unit packages, used in ever-increasing numbers, particularly for such moisture-sensitive products, as cereals, crackers, dessert powders, frozen foods, dehydrated eggs, coffee and many prepared foods, have demanded constant improvements in protective materials. Waxed papers were first applied for this use, and were followed by cellophane and rubber hydrochloride (Pliofilm). Vinylidene chloride film (Saran), polyethylene and other plastics may find similar application in the future.

Better protection for packaged foods has developed rapidly, largely as a result of the demand created by advertising claims. Advertising has sharpened competition by claiming "freshness" or "crispness" for a product; it has been the job of the packaging experts to back up these claims.

Increasingly effective protection has been forthcoming. Simple cartons have been replaced by inner-bag cartons, cartons with one or more outer wraps, or both. Combinations of papers laminated to metals, to other papers or to moisture-resistant films have all been called into the fight against moisture penetration and moisture escape.

One of the more recent and most promising developments in this sort of protective packaging is the general field of thermoplastic coatings which have a versatile range of application and certain special features which recommend them for effective protection on a number of different materials.

Thermoplastic coating materials

Although thermoplastic coating materials are the outgrowth of wax coatings, formerly widely used, they are *new* products, differing in many respects from their predecessors. These protective materials capitalize on the advantages of waxes, but are so formulated that they overcome the well-known disadvantages.

1—Coating protects edge of carbide tool immersed 3 to 5 sec. in hot-melt tank. Aeroil unit used here.



Thermoplastic coating materials are, generally speaking, solutions of blends of selected waxes with high polymeric, nonwaxy materials of complex molecular structure, which inhibit crystal formation and favor continuity of film, with a resulting impermeability to the passage of water vapor. Homogeneous through the operating range of their use, these materials do not separate, stratify or throw out in the melt tank. Their films are tough, continuous and can vary from a hard, nonblocking coating to a soft, permanently plastic material used for combining purposes.

A thermoplastic coating applied to a base, usually paper, imparts its imperviousness to water vapor. Varying thicknesses of coating can be applied, putting the degree of water-vapor transmission on a sliding scale to meet the needs of the product being packed.

Perhaps the greatest advantage of thermoplastic coatings is their controlled viscosity over a wide temperature range, in contrast to the lack of viscosity control of normal waxes and wax blends. Waxes must be taken as they are, and no control can be used to make them particularly suitable to one application or another.

Thermoplastic coatings have the advantage of effective heat-sealing qualities. Adhesion-producing materials can be used for reinforcement, but the bulkiness of the coating gives tolerance to the seal and builds up the tenacity and impermeability.

Since the new materials can be produced with predetermined characteristics, thermoplastic coating materials are now designed to do specific jobs, "tailor-made" to the need. One manufacturer divides his products into five general classifications:

1. Dipping material for the outside, or inside-outside, coating of finished container made of folding carton stock
2. Coating materials to supply water-vapor resistance to sheet materials and to yield heat-sealing films
3. Laminating adhesives for bonding papers to each other or to carton stock, where water-vapor resistance is necessary
4. Coating materials for metal tubes
5. Solvent solutions or dispersions for spray applications or dipping, where thin films are desired

This concept of building specific materials to do specific jobs has resulted in closer cooperation among converter, thermoplastic coating supplier and packer. Correctly designed packages have unlimited possibilities, and open up wide fields of usefulness in industry.

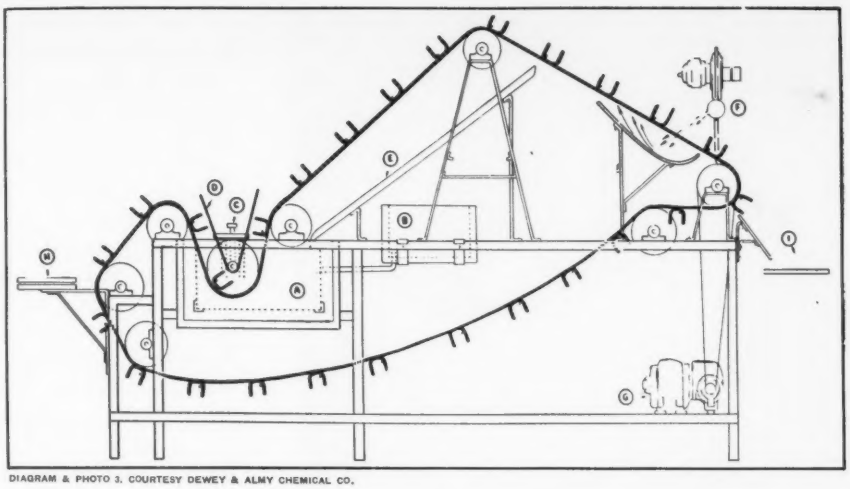


DIAGRAM & PHOTO 3, COURTESY DEWEY & ALMY CHEMICAL CO.

2—Single-dip system shows: a) steam jacketed vat; b) premelt tank with constant-level float control valve; c) bearings adjustable to immersion time; d) baffle rods to keep packages submerged; e) heated drip pan; h) loading conveyor belt; i) discharge conveyor.

Carton check chart

Packers using cartons, in addition to giving information about the physical characteristics of their products, should, in planning to apply thermoplastic coatings, specify their range of package sizes, the type of equipment available, the speed of operation, the floor space, and so forth. In other words, they should check:

1. Carton design: flap construction, tight corners, accurate die cutting, proper location of scores, proper scoring
2. Type and caliber of board stock
3. Finish of carton stock
4. Sizing of carton stock
5. Type of packaging equipment to be used
6. Type of filling equipment to be used and whether or not it will tear the carton
7. Forming facilities for carton
8. Sealing facilities for carton
9. Size and shape of mandrels
10. Adjustment of adhesive applicator
11. Adjustment of compression belts
12. Type of coating to be applied: single dip, double dip, inside-outside (Dacca) dip
13. Estimated production speed
14. Floor space available

Of equal importance with the package design, the paper stock and the thermoplastic coating selected, are the adhesive and the care used in sealing the filled cartons. No coating material has a chance of success with sloppy seals. A few pennies saved in cheap adhesives may prove an expensive economy. Care both in application and compression-belt adjustment are of paramount importance, for a poorly sealed carton cannot be plugged up by the best thermoplastic coating.

Methods of application

There are two general methods of application of thermoplastic coatings to papers. In the first, the roll or transfer type, the coating is applied to the web, and then is metered and smoothed, before moving on to the cooling drum.

Some coatings are dusted between the cooling and the rewinding stages. This general method is basic in such coating machines as those of the Mayer or Waldron type.

Also under the general classification of roll-type application is the rotogravure method, in which a recessed roll is used to apply a predetermined amount of coating. This is usually used for thinner layers, and is applied by such rotogravure machines as the Standard Process Machines.

The dip method of applying the coatings can be divided into two major types. The first, the double dip, has been applied successfully on cartons up to 850 cu. in. in size. These are the arsenal type cartons, made of jute, or double-kraft-lined chip, correctly

3—One-operator machine for outside dipping of cartons. This machine handles 120 packages per minute.





PHOTO, COURTESY AEROIL PRODUCTS CO.

4—Gas-fired "double-boiler" wax tank uses hot oil bath as transfer medium. Thermostat controls heat.

scored and cut. After the carton is set up, the package is loaded, the inner flaps are closed, and a small piece of gummed tape is placed over the joint of the flaps at the spot where the crossing of inner and outer flaps leaves a pinhole. The carton is then properly squared up, and sealed in a suitable automatic gluing and sealing unit. The adhesive used must be of good quality and effectiveness if adequate protection is desired. The flaps are held down by compression belts until they are sealed for 100 per cent of their area. The package, after inspection, is sent through the double dip machine. The first dip is of about 15 sec. duration, in a bath of molten thermoplastic coating held at approximately 200 deg. F. This allows a penetration of about 40 per cent of the carton stock, and gives an anchorage for the coating.

The dipped carton is then immersed for 4–6 sec. in the second dip tank, which is held at 165–175 deg. F., depending upon the board stock and the speed of the machine. When cooled, this gives a thin, continuous, uniform coating which is hard and nonblocking. The coating has a high degree of tensile strength, high cohesion, and firm anchorage. Since all fibres are covered, there is practically no chance of wickage or seepage of water vapor into the package. Exhaustive tests have shown an extremely high resistance to insect infestation because the hard, smooth film and the corner coverage give no grip for entry.

The second process of coating by dip application, the inside-outside, or Dacca method, consists of immersing a fully-formed or set-up, but unfilled, carton, the bottom flap of which first has been well glued, into a bath of molten thermoplastic coating material, coating both the inside and the outside surfaces of the carton. The carton is inverted and drained in a hot chamber, and then is cooled, to give a thin, uniform coating. After filling, the package is heat sealed, using the coating material for the seal.

Several other machines, such as chocolate enrobers or milk-container dipping machines, are available for applying thermoplastic coatings.

Resistance to water-vapor penetration as well as to moisture itself depends largely upon the design of the container and the care with which it is made. However, with well-made production samples, repeated laboratory tests have shown that boxes made from patent coated news, coated either double dip or inside-outside, provide a water-vapor resistance in the finished package under 0.10 gram transmission per 100 sq. in. in 24 hr. at 100 deg. F. at 90 per cent relative humidity, using anhydrous calcium chloride as a pack.

Thermoplastic laminating adhesives

The combination of desirable characteristics in a laminating adhesive is a difficult one to achieve. The adhesive must be crease resistant; it must possess a high degree of resistance to water-vapor transmission; it must be capable of high-speed machine application; it must age well and remain permanently flexible. It must have good adhesion, the widest possible temperature range, and a chamois-like feeling to the fold. It must be capable of even distribution throughout the sheet without splashes or ripples, and it must reduce to the minimum the tendency toward delamination. The cohesive strength of the thermoplastic adhesive is particularly important where the laminated material is made into a bag and heat sealed. A properly formulated thermoplastic material can overcome all the difficulties inherent in the problem and provide an excellent laminating adhesive, but care is required in its manufacture and combination.

Conclusions

While the past few years have seen a great extension of the application of thermoplastic coatings, it is very probable that the future of these materials has, as yet, only been sketched in lightly. The increasing degree of controllability in application, in protection, in composition, enhances the usefulness of thermoplastics.

There is a very real and widespread demand for better protection in many packaging fields which, hitherto, have either not been able to find adequate wraps or in which competition was not previously sufficiently keen to warrant top-notch output. The effect of advertising is apparent in such fields as cereals, breads, dehydrated and dried foods of all kinds, frozen foods, many prepared soups, desserts and the like, and even to some extent in fresh vegetables, which have begun to appear in protective packages. New applications are being found constantly, and improvements are being made in accustomed uses. Many of today's most important problems in water-vapor control will find solutions in tomorrow's thermoplastic coatings.

Processing packaging papers with animal glues

With the development of large-scale demands for paper stocks for packaging purposes, greater interest has been focused by suppliers and users on specific strength and surface characteristics of paper such as folding endurance, bursting strength, resistance to wet rubbing and other properties. Greater interest has also been focused on those auxiliary materials—especially adhesives—which directly affect these strength characteristics when paper stocks are prepared for packaging use.

In the current production of packaging papers and boards, animal glues are widely used as binding agents, sizings and coating materials. Their largest use occurs as adhesives in the production of set-up and folding boxes, spiral tube containers and convolute tube containers, because of their high initial tack, fast set, strength of bond and durability. These glues are also widely used as beater sizings, surface sizings and, to a lesser extent, in the preparation of coating stocks.

Beater sizing

The first step in the conversion of pulp to paper is the beating operation. As the term implies, a beater or large, oval-shaped tub is used, in which the pulp is cut and brushed to the desired degree. The beater solution contains water, fillers such as clay, coloring materials when needed, and sizing to impart moisture resistance to the fibres. Almost all writing, printing and wrapping papers are sized in this way.

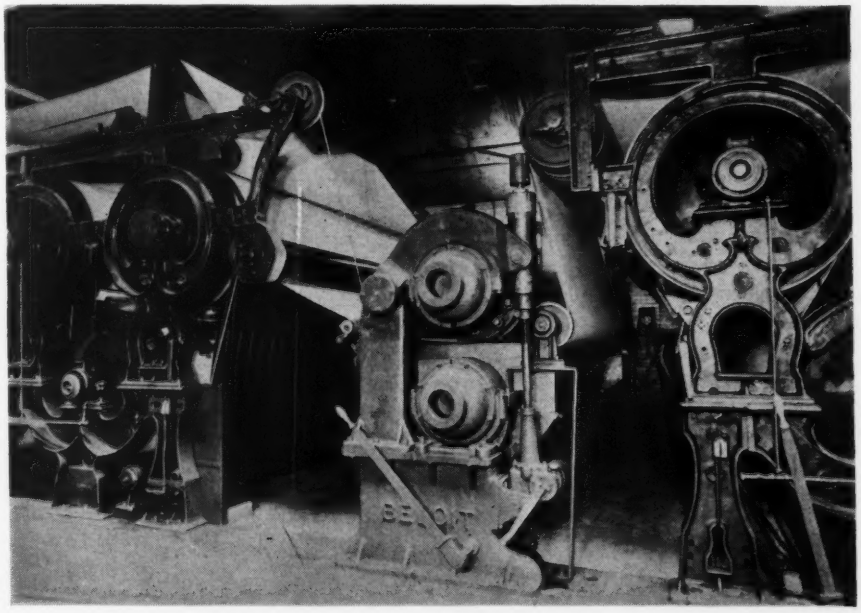
In the sizing of certain types of inexpensive paper, combinations of rosin soap and alum are largely used. However, sizing with animal glue imparts to finished paper high degrees of hardness, good "rattle" qualities, resilience and folding strength. In the manufacture of fine papers, where relatively small amounts of rosin-sizing are used, animal glue is commonly added to improve the retention and dispersion of the size. This effect is obtained by means of the strong and continuous surface film formed by glue. Similarly, in making hard finished boards and papers as well as body stock for coating, animal glue may be added to increase the coating effect and to ensure freedom from surface fuzz without making the product brittle. Colloidal qualities of glue are also utilized in preparing papers of exceptional strength, such as kraft stock for gummed tapes and spinning and twisting papers.

When animal glue is used in the beater, noticeable increases in the bursting strength and folding endurance of coated papers containing clay and in the bursting strength of kraft papers have been observed. The chief influence of glue, however, seems to be to increase the degree of sizing and to improve such important properties as firmness, hardness, resilience, rattle and handling qualities of the finished papers, and the improvement of these qualities seems to be dependent upon the influence of glue as a protective colloid on the materials present in the beater.

Surface sizing

Beater sizing makes paper moisture resistant. Surface sizing of paper increases its strength and toughness. The terms "surface sizing," "top sizing" and

PHOTO, COURTESY ANIMAL GLUE INFORMATION SERVICE



Machine showing paper going through the rollers in process of being sized with animal glue for good package performance.

"tub sizing" are used commonly to refer to the process of applying sizing materials to paper which has been formed into sheets or continuous webs. In early paper manufacture, hand-made sheets were dipped manually into a tub of size hence the term, "tub sizing." Although sizing methods have been largely mechanized, this particular term has persisted through the years and is often used in drawing specifications for paper.

Tub sizing with glue makes paper fairly nonabsorbent and gives it a smooth hard surface superior to that obtained by rosin sizing alone. In addition, paper which is surface sized with glue possesses such desirable qualities as firmness and resilience, and also—depending to some extent on the distribution of glue throughout the paper—the ability to withstand repeated erasures. Tub sizing with glue imparts characteristics of strength and resistance to wear to a greater extent than when glue is blended with other sizing agents or mixtures. Strength characteristics of paper react in two ways to glue tub sizing: 1) bursting strength increases with the increased retention of glue; 2) the folding endurance increases with increased glue content to a certain point and then decreases.

Resistance to water and wet rubbing of glue-sized papers may be increased markedly by treatment with glue hardening or tanning agents, such as formaldehyde or its polymers. The folding endurance of glue-sized papers may be increased by the addition of hygroscopic salts, such as sodium acetate, or of glycerin or of invert sugars.

Coatings

The term "coated papers" ordinarily applies to those special surfaced papers employed so largely for printing and illustrations utilizing fine-screen half tones to secure vivid contrasts. These papers require a smoother, more continuous and semiabsorbent surface than is usually obtainable in uncoated papers. Included in the coated category are: magazine, book and catalog papers; metal coated papers; glazed and highly finished papers used in box making; barytes-coated photographic papers; and lithographic and offset papers.

The surface of a coated paper is made up of mineral matter bound together and to the body of the sheet by a suitable adhesive—animal glue, starch or casein, or a mixture of these. Paper specifically prepared for coating is called "body" or "coating stock." During the coating operation, the body stock is suspended in a water mixture of minerals and adhesive which may also contain, in some cases, waxes, soaps, or similar softening or finishing agents. Brush-type machines are used in applying the coating mix. In certain high grade papers, two separate layers are used for each side of a coated surface. Where the under-coating is a relatively simple and inexpensive mixture of clay and adhesive, the outer layer may incorporate special tinting, finishing or waterproofing materials. Following the coating process, the paper is dried and then calendered. In special cases, this may be followed by friction or flint glazing.

For most coatings, the body stock is lightly finished, being calendered merely enough to even up the surfaces. Freedom from surface fuzz is highly desirable since brushed-up fibres cause difficulties in coating and finishing as well as in printing and lithographing of the finished papers. Whatever the grade of paper stock used, uniformity throughout the coating run is desired, because minor variations in the body are aggravated in the coating and finishing processes.

The coating mix generally contains a base of white mineral matter which may be tinted or colored with insoluble pigments and lakes or with soluble dyestuffs to produce the desired shade. The character of the finished paper is largely affected by the choice of the proper mineral matter as well as that of the adhesive and special materials that go into the making up of the coating mix.

The following qualities mark animal glues especially developed for sizing and coating purposes: 1) freedom from insoluble materials; 2) a viscosity which permits use of ordinary equipment at desired dilution of color mix and within the temperature range of working conditions; 3) high adhesiveness; 4) good clay suspending power and 5) freedom from foam, impurities and excessive greases.

The proportion of adhesive used in coating mixtures varies with the kind of mineral used and with production requirements. For example, papers made especially for printing only with black ink often are relatively soft-sized, whereas papers used for multicolor work (which must stand repeated impressions for different colors) are generally hard-sized.

As in beater and surface sizings, glue used for coating purposes can be made moisture resistant by the use of tanning or hardening agents such as chrome alum, formaldehyde or hexyl methylamine.

Glues which are free from chemical residues are especially valuable in making metal coated papers. Neutral glues permit the use of a wider range of colors than is possible with alkaline adhesives. By working with glue, troublesome side reactions with satin white are largely avoided. Glue bound coatings for flexible card materials are claimed to impart unusual resilience. High-grade animal glues, which may be used in relatively small proportions, are of value in gaining a high degree of elasticity for folding papers and for those papers which are to be embossed and otherwise similarly processed.

Qualities of specific adhesives not only affect their use as sizing and coating agents, they also lend themselves readily to the packaging of certain products. Animal glue, for example, is insoluble in grease, oil and hydrocarbons, and so wooden containers lined with glue have been widely used to package oils, greases, turpentine and paint. In similar manner, boxes and spiral and convolute containers when sized with plasticized animal glue have been widely used for greaseproofing and retention of volatile oils.

Lacquers in packaging

by Robert L. Buttle

The extreme importance of lacquer coating in packaging is not always appreciated. Moistureproofness, greaseproofness, heat sealability, gloss for sales appeal—all of these properties are attainable by application of the proper lacquer coating.

The word "lacquer," early used in this country to denote solely cellulose nitrate coatings, has been broadened by recent usage to denote all films formed by solvent evaporation. Such films, with suitable formulation and application, will supply resistance to the passage of water vapor, water, oils, greases and even gases. They can be made heat sealable. In addition, they supply the gloss to make labels and packages attractive as well as resistant to dirt and handling.

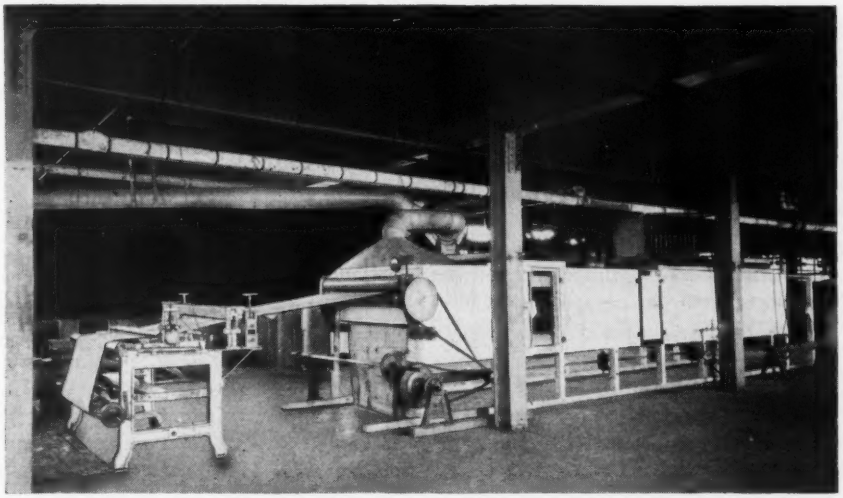
Water-vapor barrier

The water-vapor barrier placed on a package is a lacquer usually made from chlorinated rubber, ethyl cellulose, cyclized rubber, cellulose nitrate, or a vinyl copolymer, blended with waxes, plasticizers and solvents. Application is made by the standard types of coating equipment—for sheet work, a Chambers type machine or revolving drum carrying the sheet over an applicator roller; for web work, a reverse roll coater or roll applicator. The paper then goes through a heat tunnel where the solvents are evaporated and removed by exhaust. The resulting lacquer film is the barrier limiting the passage of water vapor. It is essential that a continuous film be applied as pinholes or protruding fibres, acting as wicks, would offer no barrier. Assuming proper formulation and application, the lacquer film will give readings on a Southwick Cabinet as low as 0.1 g. per 100 sq. in. 24 hr. at 100 deg. F. 90 per cent R. H. with 1-lb. solids per 1000 sq. ft. on glassine. A moistureproof barrier may also be applied with a hot melt instead of a solvent type coating. In this case, the coating is made liquid by heat rather than by solvent and applied in a hot liquid state, solidifying immediately on cooling. Equipment required is limited to a hot-melt applicator and usually a chilled roll before the rewind.

Greaseproof barrier

This word covers a vast amount of ground. The question is—how greaseproof and against what? Doughnut packages, for example, require grease resistance for a few days. Oil containers, on the other hand, require complete resistance to oil and grease for a long possible storage period. Greaseproof coatings are available—made from such a wide range of materials as cellulose nitrate, cellulose acetate, zein, polyamides, ethyl cellulose, vinyls and others. The resistance is supplied by a continuous film of lacquer coating. In obtaining grease resistance as in achieving water-vapor resistance, absence of pinholes or protruding fibres (to act as a wick) is of prime importance. Wicks are to be particularly guarded against in the case of grease resistance for usually a stronger paper stock is required. It is not economical to bury them with a coating film three or four times as deep as would be necessary with a more carefully chosen stock. An extra penny spent on the proper paper will be saved manifold in coating material. It is also important to select paper stock which will fold when scored so that fibres do not fracture and thus puncture the lacquer film. The development as well as the use of greaseproof coatings is increasing steadily so that now certain lacquer films are sufficiently

PHOTOS 1 AND 2, COURTESY FLOOD & CONKLIN MFG. CO.



1—Extreme care is required in the application of lacquers. With this modern heat tunnel, lacquer is applied by the split-knife method. Induction heating is used, the air being blown across steam pipes to obtain required temperatures.

impervious to penetration to resist, under test, even the heat of boiling oil.

Heat-sealing packages

Interest in a heat-sealing package is widespread. The package may be an envelope or pouch holding soup mixes or powders. It may be made of glassine or aluminum foil. In any case, the seal or package closure must be strong as the package, and present the same barrier—whether against water vapor from the outside or grease from the inside. In addition to a good appearance, a heat-sealed package offers the advantage of being tamperproof.

This heat seal feature will often be supplied by the lacquer coating. Manufacture of such coating requires manipulation of many of the newer resins such as vinyl copolymers, ethyl cellulose, polyamides, zein, chlorinated rubbers, cyclized rubber, etc. These may be coated all over to add film strength to the paper and to give a barrier against humidity, grease or some other specific item, or they may be strip coated where the seal is to be made.

It should be remembered that heat sealing is accomplished by a combination of temperature, pressure and dwell-time in direct relation. Therefore, if one of these three fundamentals must be limited, compensation is demanded of the other two. For example, a soft or breakable package can have little pressure applied, so more temperature and dwell-time will be required than when the coating is heat sealed with normal pressure.

Emulsions are often used for heat sealing, particularly if the paper stock is of an absorbent nature. The water swells the paper fibre so that the coating remains on the surface to a greater extent than if solvent type coatings are used. Application of over-all coating with emulsions is not general practice on glassine, however, because of the unattractive puckering or distortion of the paper from the water.

Gloss for sales appeal

By far the largest volume of decorative lacquer before the recent war was spirit varnish made from Manila gum in alcohol. This material gave a reasonable gloss, was inexpensive and served many purposes well. But it has been improved greatly. One of the weaknesses of spirit varnish was its poor resistance to chafing and abrasion. Two surfaces rubbing together as they often would during shipment, frequently caused unsightly powdering of the finish. Gloss lacquers are now made from the new synthetics such as vinyl copolymers, ethyl cellulose, urea, cellulose acetate, as well as from cellulose nitrate. The gloss obtained is full; chafe resistance and waterproofness are suitable.

At this point, we will crawl in a bit from that limb we are on before we hear a booming voice sarcastically request a nice full gloss on some blotting paper. The paper plays a most important part. A litho-coated sheet will hold out what gloss the lacquer has, while a kraft is relatively impractical. A machine finish never offers as good a coating surface as a filled sheet, provided the filling has a hard but reasonably flexible binder to minimize penetration. Lacquer coating on a suitable paper can achieve a gloss like transparent foil.

Handling and operation

A word of caution should be given to those who want to consider the newly available finishes. These new coatings, made of cellulose nitrate, ethyl cellulose,

TABLE I—RELATIVE CHARACTERISTICS OF RESINS FOR USE IN PACKAGING

	Water	*Water vapor**	*Acid*	*Alkali*	*Alcohol**	*Gasoline*	*Oil**	*Flammability*	*Heat*	*Cold*	*Sunlight*	*Wear*	*Abrasion*	*Heat-seal**	*Flexibility*	*Adhesion*	*Gloss*	*Color*	*Odor*
CELLULOSE NITRATE	G	G	F	F	F	G	G	P	F	F	F	F	G	G	G	E	G	G	G
CELLULOSE ACETATE	F	P	F	F	P	G	G	G	E	F	E	F	F	G	F	F	G	E	E
CELLULOSE ACETATE BUTYRATE	G	F	F	F	P	G	G	G	E	F	E	F	F	F	P	G	G	G	E
ETHYL CELLULOSE	E	G	F	E	P	F	P	G	E	E	E	G	F	E	G	G	F	G	E
PHENOLICS (GENERAL)	E	G	E	G	E	F	E	G	G	P	P	F	E	P	P	G	G	P	F
ALKYDS (GENERAL)	F	G	F	F	F	G	G	F	G	F	G	G	G	P	G	G	G	G	G
UREA AND MELAMINE	E	P	G	G	G	G	G	G	G	F	G	G	G	P	F	G	G	E	E
VINYL ACETATE	F	P	G	G	P	E	E	G	F	F	G	G	F	E	G	G	G	G	E
VINYL CHLORIDE	E	F	E	E	E	E	E	G	F	E	F	E	E	F	E	P	F	G	E
COPOLYMER VINYLS	E	F	E	E	E	E	E	G	F	G	F	E	E	E	E	F	G	E	E
VINYL BUTYRATE	G‡	F†	G‡	G‡	F†	G†	G	G	G†	G	G	G	G	G	G	G	G	G	E
METHACRYLATES	G	F	G	G	G‡	G‡	G	G	E	G	E	G	G	G	G	E	G	E	G
CHLORINATED RUBBER	E	E	E	G	E	G	F	E	P	P	P	F	G	F	F	G	G	P	E
CYCLIZED RUBBER	E	E	E	G	E	P	P	E	G	P	P	F	E	E	F	F	G	F	E

E—Excellent. G—Good. F—Fair. P—Poor.
* Depending upon formulation of the lacquer.
† After vulcanizing.
‡ Some types.

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2—The special lacquer coating employed on these box papers plays a dual role: it emphasizes the brilliant color of the wrappers and resists the soiling hazards of much handling.

vinyl copolymers, ureas, synthetic rubber compounds, cellulose acetate, etc., contain highly volatile solvents, such as acetone and methyl ethyl ketone, ethyl acetate, benzosol and toluene. They present an explosive hazard and it is necessary that extreme care be taken in handling them.

In order to operate at efficient speeds, heat is necessary in the tunnel to expedite drying. All solvents have an evaporating range, differing with each, and also an N-point—which is the temperature at which the end or tail is driven off by volatilization. Thus, it is necessary to have a temperature in the heat tunnel which will bring the temperature of the paper above the N-point temperature in order to eliminate the solvent so that the coating is dry and will not block or stick together whether stacked in sheets or wound in a roll. However, removal of the heated air into which solvent has evaporated is just as important—in fact more so—both from a drying standpoint and from the standpoint of reasonable safety.

Tests on commercial equipment show that heat alone will not dry a film if evaporated solvent lies on the film surface; the film just stays wet. In the same manner, exhaust of solvent alone, without heat, will not dry the film—it needs elevated temperatures to "kick out" the solvent. But the combination of sufficient heat with efficient solvent exhaust dries the film thoroughly and quickly so that production may be appreciably increased through the accomplishment of higher operating speeds.

That is briefly the theory of solvent coating. But what about the hundreds of direct and indirect gas-fired heat tunnels still in use? The difference between direct and indirect gas-firing (for the purpose of this article) lies in the matter of separation of the gas flame from the part of the tunnel through which the paper passes. For indirect gas-firing this separation is accomplished by a metal partition—usually perforated.

Solvents of the inflammable kind, such as those previously mentioned, should not be used in gas-fired tunnels as described above. Even if there are no perforations in the division between the paper traversing section and the flame, ovens of this type are dangerous in this writer's opinion because the fumes work around from the coating head and are likely to ignite. Tunnels can be heated with steam pipes, hot air from gas- or coal-fired boilers located in another room, or electrically by buss bar. In each case the radiation should be sufficient to maintain the desired temperature with the exhaust in operation.

The proper relationship of exhaust to temperature is a part of the coating application technique which has received too little attention. The small fellow who feels that an adequate exhaust will waste the heat he has built up is small indeed, for more heat and more exhaust will increase operating speeds.

New fields lie ahead for progressive coaters who will investigate these new finishes. But the first step is to condition the equipment for handling them. To many this will mean a whole revamping of the heat tunnel, while to others it will mean slightly more radiation (infrared lamps will help) and more adequate exhaust. In any case, these new solvent coatings should not be handled on old spirit-varnish equipment. The situation should be studied and required adjustments made.

Despite the enormous technical advancement in formulating, in resin development, and in the lacquer field in general throughout war years, the ultimate in package perfection must be obtained by complete integration of all elements. The paper plays an important part in the package. Also necessary for successful coating are: knowledge, experience and equipment to get the most from the lacquer formulation; to get a continuous film to effect a real barrier; and to get the full gloss and film depth on decorative work. This is all part of building a package to suit requirements.

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Coating and embossing equipment

The relationship which has always existed between coating formulations and coating methods has become more pronounced since the advent of the newer types of synthetic coating material, and has necessitated improvements in coating equipment. There are various coating machine types, such as brush, roll, knife and spray machines. In every instance, whether a coating is used purely for decorative purposes or to increase the protective qualities of the packaging material, selection of the proper machine will depend upon the coating material which is used.

Selection of machines

Coatings which might show brush marks can be applied better by a roll knife coater. Those with a tendency to rib, i.e., coatings with a high surface tension, can be handled by a roll coater. A spraying machine can be used to advantage on rough surfaces, but this method tends to dry the coating material during the spraying operation.

In applying plastic coating, paper, foil and other materials with hard, smooth nonporous surfaces are best treated by flood-coating with a roll coater. Such coatings will, if handled correctly, flow out to an even, impervious plastic film.

The adhesion with such a method of coating and appearance of the finished surface are found to be much superior to other means of application.

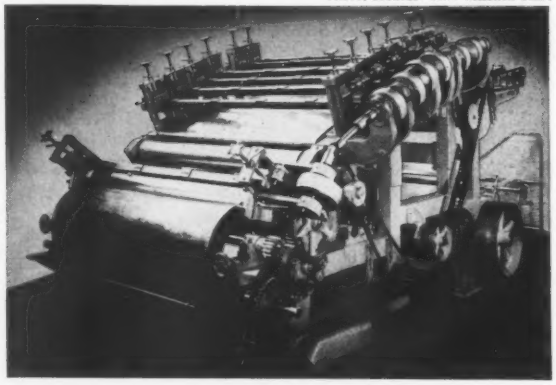
For many requirements, a heavy rubber coating calender application is required. This is especially true in the case of thermoplastic materials which are not readily soluble.

For the protection of food, coatings of lacquer and rubber derivatives are popular, especially if packages are to be heat sealed. Varnishes are also used to coat papers for the protection of foodstuffs. They are applied by either the reverse-roll type of coating machine or a knife coater. The reverse-roll machine will successfully handle coatings with a solid content up to 50 per cent, whereas a knife coater can handle a solid content of 70–75 per cent.

The best printed effects—direct or offset printing—are obtainable on clay coating because mineral substances present a fine surface for printing inks. Clay coating may be applied to paper with a brush and then brushed out. As this method is limited in speed, other means of applying clay coatings are used, such as air-brush and spraying.

Clay coatings, excellent bases for printing, are efficiently applied by this 7-brush arch bed coater.

PHOTO, COURTESY JOHN WALDRON CORP.



Embossing machines

Paper or board may be made more attractive by embossing, which adds depth and tone to a printed surface. This treatment tends to soften paper and is occasionally used to break paper that is apt to curl from any cause. However, such treatment is not recommended where strength is required.

For the embossing of paper or board, a hydraulic machine offers many advantages. Since the rollers are mounted in subframes, they can be quickly removed. Thus it is possible for an operator to use only one frame with several sets of rolls.

Most designs can be embossed without difficulty. Some designs offer a problem because the varying depth of the engraving makes the winding operation difficult. Hydraulic embossing units produce a uniform pressure across the face of the roller and turn out a uniformly embossed web.

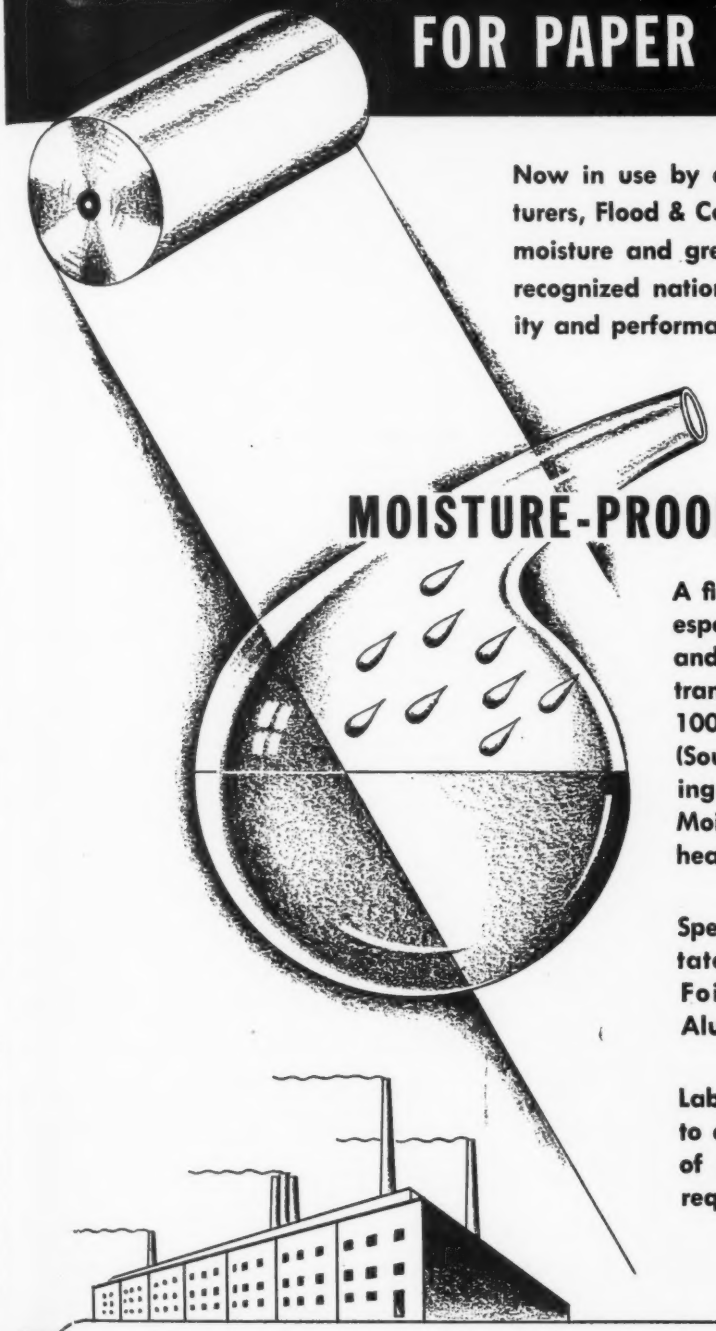
An unusually interesting combination is *print embossing* in which the ink is laid on the embossing pattern of the engraved roll and transferred to the surface of the paper as the embossing is pressed into it.

Inking attachments can be mounted on the embossing machine. The ink is either laid in low spots of the embossing, kissed on the high spots (for shadow effects), or applied in varying combinations of the two. Ink-embossed effects in multicolors are used to advantage on stocks for labels and for catalogs. In many cases, this type of embossing is also employed in the production of covers.

Another method of embossing is that of running an engraved roller in contact with a paper roller without gears. The paper roller is moved from side to side in the machine to iron the surface of it. Thus a flat-back embossed effect is obtained. The paper stock is embossed only slightly, but it is attractive for art work, stationery, greeting cards and favors. Boring the steel-engraved roll is an aid in successfully accentuating good effects in sharp relief.

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WRAPPINGS AND LAMINATIONS



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New developments in wrappings

by Herbert T. Holbrook

During the war, the packaging industry and key administrative and laboratory personnel in the services set standards of performance for wrappings, developed and produced materials to meet these standards, prepared and issued specifications, and cooperated to see that they were correctly understood and applied. Among the specifications thus developed in the protective barrier field, there were three of special and lasting significance: Joint Army-Navy Specifications on "Barrier-materials, Waterproof, Flexible" (JAN-P-125), "Barrier-material, Greaseproof" (JAN-P-121); and "Barrier-material; Moisture-vaporproof, Flexible" (JAN-P-131).

To cover all the multitude of combinations and coatings to make these barriers would be far beyond the scope of this article. Some, however, were outstanding by reason of their importance either from a technical or from a supply point of view. In most cases, they were outstanding for both.

In discussing these specifications and materials, several important considerations should be kept in mind. In the first place, the hazards against which material had to be protected were more severe than those encountered in normal commercial overseas shipments. Secondly, many of the most usable raw materials, such as rubber and its derivatives, were almost entirely denied, while only limited quantities of other needed materials—especially in the synthetic resin and wax fields—could be allocated for packaging purposes. Thirdly, there was a complete absence of any need to compromise either for decorative effect or for cost.

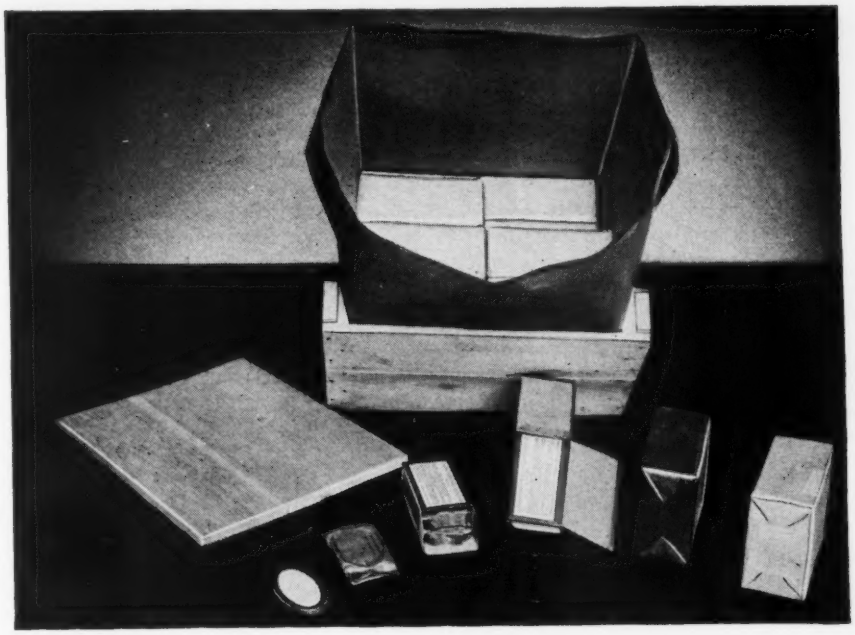
Waterproof barrier materials[1]

Waterproof barrier materials were used on prewar combinations of kraft paper laminated with asphalt, but were greatly improved, particularly with regard to waterproofness and strength. As in the case of both greaseproof and water-vaporproof materials, the wide range of demands required different performance

[1] The requirements for waterproof-barrier materials are covered in Joint Army-Navy Specification JAN-P-125.

TABLE I—WATERPROOF BARRIER MATERIALS

End Use	*Description*	*Typical combinations—paper weight—lb. minimum (basis 24 × 36-500)*	*Laminating asphalt—lb. total weight (minimum)*	*Special notes*
CASE LINERS	Duplex (2 plies of paper) plain or creped paper not reinforced	One-ply—40 lb. One-ply—60 lb. or Two plies—50 lb. each	50	Required that one-ply be asphalt or wax impregnated, or wet-strength kraft
SHROUDS AND BALING	Same as above but reinforced plain or creped paper	Two plies—30 lb. each	80	Reinforcing: at least 20 strands per ft. in two directions
	Triplex (3 plies of paper) not reinforced	Three plies—30 lb. each	150	At least one, after all three plies creped to provide stretch and flexibility
CRATE TOP COVERS	Duplex reinforced	Two plies—30 lb. each	80	Reinforcing: at least 20 strands per ft. in two directions; required that both plies be asphalt or wax impregnated or wet-strength kraft
CRATE LINERS	Duplex—not reinforced	Two plies—50 lb. each	50	Plain paper (not creped)
INTERIOR WRAPS	Duplex—not reinforced	Two plies—30 lb. each	50	.....
TARPAULINS	Duplex reinforced	Two plies—40 lb. each	50	Reinforcing: at least 20 strands per ft. in two directions; both plies must be asphalt or wax impregnated or wet-strength kraft
BALING	Light duty: duplex, creped	Two plies—30 lb. each	40	Creped to give at least 15% stretch in either direction
	Heavy duty: paper-asphalt-cloth combination	Paper-ply—30 lb. Cloth—7½ oz. burlap or 2.35 yd.	60	.....



Sealed in corrosion-resistant wrappers, two tire patch kits are placed in a paperboard box and four boxes are overpacked in a larger paperboard box which is wrapped, sealed, wax-dipped and finally overwrapped and sealed. For shipping, a wood case with waterproof liner is used. This is a typical application of Method 1A-2.

standards, consequently different combinations of component materials were employed for different end uses. Table I includes the most important end uses, together with a brief description of those combinations which best satisfied the specific requirements of each. Further data is given in the chart opposite p. 862.

A few generalities which affect all types of waterproof barrier materials should be made. The greatest single improvement made during the war was in increasing resistance to water permeation. From a prewar average of less than 6 hr. (on creased samples), resistance time was raised to an average of 15–18 hr., the best materials showing values consistently above 24 hours. Most of the improvement was due to the increase in the quantity and quality of the asphalt used.

"Stretch" in the combined sheets was found to have more significance in determining resistance to tearing and puncture than actual tear and Mullen test values. A barrier with two-way stretch was superior to one stretchable in a single direction only. In addition, stretchable sheets were easier to apply, especially if preforming a case liner or molding around a complex shape was required.

The chief deficiency of waterproof barrier materials was their poor performance at low temperatures. Virtually all cracked on impact or bending at zero temperatures. However, the work of some suppliers indicates that with a little more research on asphalt and wax blending, satisfactory cold-weather performance can be achieved.

Greaseproof barrier materials

The function and application of greaseproof barrier materials is discussed in more detail under Method I and Method IA in *Packaging of Metal Products*, p. 863. Unlike waterproof papers, a wide range of components was utilized in making greaseproof wraps. This range was dictated primarily by shortages of materials and by less stringent cost limitation. Combinations used in the laminated and coated types of greaseproof wrappings had little precedent in prewar manufacture. Greaseproof barriers, as covered in JAN-P-121, fall into two classifications: Grade A and Grade C.[2] Both had the same requirements for greaseproofness (900 sec. turpentine resistance on creased samples) and for neutrality (pH range of 6.5 to 7.5). They varied, however, in other characteristics, particularly in strength, and in their end uses, Grade A being designed primarily for Method I and Grade C for Method IA applications, meeting these respective requirements.

Grade A was more widely used. In spite of the fact that microcrystalline wax was restricted to the manufacture of Grade C, there was far more latitude in the combination of material and coatings that could be and were used to make Grade A barriers. The following paragraphs describe briefly some of the more widely used sheets which were developed to meet the specification requirements for barrier materials.

Grade A, Type I—Strength property requirements for these materials were rated at a minimum 70-lb. Mullen, and 125-g. tear for nonstretchable sheets; and a minimum 35-lb. Mullen, 63-g. tear for sheets having minimum stretch of 15 per cent in one direction. Combinations used in laminations were as follows:

1. Neutral kraft (generally 50- to 60-lb. basis weight) laminated to No. 88 cellulose acetate with emulsion type of resin. Some suppliers were able to use a lightweight kraft and to crepe the combination to meet stretch requirements.

[2] Earlier specifications had included a third grade—Grade B—similar to Grade A except for a wider pH range (5.0 to 8.0). Also, there was no requirement for an identifying color. As soon as supplies of Grade A were adequate, the Grade B was dropped.

Creping also gave greater flexibility and moldability for manual wrapping operations. In acetate-kraft combinations, the acetate provided greaseproofness and the kraft gave the necessary strength.

2. Two neutral kraft sheets (each 35- to 50-lb. basis weight) laminated with an emulsion type of greaseproof resin. This combination was embossed for flexibility and moldability. The two kraft plies provided strength, and the resin provided the greaseproof barrier.
3. Two sheets of neutral kraft (each 35- to 50-lb. basis weight) resin-laminated, with one sheet coated with resin or lacquer for greaseproofness.
4. Two sheets of 40-lb. neutral glassine laminated with a special nonmicrocrystalline wax blend.

Grade A, Type II—The strength properties of Type II were rated at a minimum 40-lb. Mullen, 40-g. tear for nonstretchable sheets; and a minimum 20-lb. Mullen, 20-g. tear for sheets with a 15 per cent stretch in one direction. Below are listed some of the combinations employed:

1. Neutral kraft (45–50 lb.) having various coatings, including special caseins, lacquers, polyvinyl alcohol, etc. The coatings provided greaseproofness, and in some cases heat-sealability.
2. Two sheets of lightweight (25–30 lb.) neutral kraft laminated with resin or wax (nonmicrocrystalline).
3. Two sheets of 25-lb. neutral glassine, laminated with wax (nonmicrocrystalline).
4. Creped, 30-lb. neutral kraft, impregnated and coated with a nonmicrocrystalline wax.
5. 40-lb. vegetable parchment, "puckered" to give stretch.

Grade A, Type III—For Type III, strength properties were rated at a minimum 20-lb. Mullen, 12-g. tear in nonstretchable sheets; and a maximum 10-lb. Mullen, 6-g. tear on sheets having a stretch of 15 per cent or more in one direction. This type may be comprised of:

1. 30-lb. kraft, coated with lacquer, caseins, etc.
2. 40-lb. vegetable parchment, flat.
3. Special heavy moistureproof coated cellophane, single ply.
4. Cellophane laminated to glassine with resin or nonmicrocrystalline wax.

Grade C—Grade C is inseparably linked with so-called Method IA packaging (see *Packaging of Metal Products*, p. 863). Briefly, this packaging method involves enclosing a part or carton in a barrier sufficiently waterproof to withstand leaks after a rigorous cycling for 10 days under extremes of hot and cold temperatures, intermittent soaking in water-sprays and a generous amount of rough handling. Grade C sheets met these demands admirably. The moldability, self-sealability and waterproofness required were accomplished by generous coatings and impregnation of microcrystalline wax. Since no other satisfactory materials were available in sufficient quantities to impart these characteristics to Grade C, sufficient quantities of microcrystalline wax were allocated to meet the services' needs. This was indeed an Herculean task since the quantity required for Grade C and Method IA packaging in 1944 was roughly three times the total tonnage of microcrystalline wax produced by the Petroleum Industry in 1939.

The basis for virtually all Grade C wraps was a proprietary product developed originally as a protective covering for underground pipes. This product was constructed of 44 by 40 thread-count scrim cotton cloth laminated to No. 88 cellulose acetate with wax. Approximately $^1/_2$ lb. of wax was used for laminating and coating—sufficient to assure waterproofness and greaseproofness, plus a high degree of self-sealability. Other manufacturers were permitted to produce this combination, and due to shortages of 44 by 40 cloth and acetate, utilized other cloth construction and, in some cases, replaced acetate with cellophane. Some trouble was experienced with the cellophane, however, due to the greater tendency of cellophane to shrink, and to cause failure of the seams on tight-wrapped packages.

In addition to these combinations, one manufacturer was able to meet the requirements of the specification by substituting a special asphalted blend for wax. The combination performed satisfactorily, but the black coating was objectionable.

Grade C was also subdivided into three types, each consistent with Grade A types on Mullen, but requiring 425-g. tear for Type 1, 175 for Type II and 25 for Type III, with one half the values for stretchable sheets. The combinations described above were the only ones which fully satisfied Type I requirements. Most Type II combinations utilized either two sheets of 40- or 50-lb. neutral kraft, coated, impregnated and laminated with wax, or a single ply of creped kraft, also wax-treated. A few combinations of cloth and acetate which failed to meet Type I requirements were also approved for Type II.

All Type III combinations, which were used only to a very limited extent, were made of neutral kraft, impregnated and coated with wax.

Water-vaporproof barrier materials

Water-vaporproof barriers were certainly the most complex, and from a technical standpoint, probably the most interesting of the war-inspired laminations. When the so-called Method II (dehydrated) pack was first developed, Pliofilm was used as the water-vapor barrier. Its selection was based on its transparency, its heat-sealability, and its relatively low MVTR—0.25 g. per 100 sq. in. per 24 hr. by the General Foods Cabinet method. Because of the scarcity of rubber, however, Pliofilm was denied to applications other than aircraft, and extraordinary measures had to be taken to find substitutes for the other services. The problem was made no easier by the drastic requirements set up by the

services for suitable materials. Before acceptance, the proposed barrier was subjected[3] to a series of rigorous tests. First, creased samples of the material had to show a maximum MVTR of 0.25. If this requisite was met, completed packages of specified size and construction were exposed to the full 10-day Method IA cycle, after which they were kept at 90 per cent relative humidity at 90 deg. for an additional 30 days and finally were again subjected to an eight-day cycle of intermittent cold and heat, water spray and rough handling. After this punishment, the material was acceptable only if there was a pick-up of moisture of the enclosed desiccant of not more than 20 per cent.

The following list covers the construction of at least 90 per cent of those used:

Grade C, Type I—The same materials (described above) which successfully passed the greaseproof barrier specification for Grade C, Type I, were found to make outstandingly successful Method II packages, if the sheet was wrapped around a carton, seams and closures sealed with special waterproof adhesive, and the wrapped package dipped in microcrystalline wax to form a coating of about $^1/_{16}$ inch. The average MVTR of Grade C, Type I was 0.20 to 0.22 g. without the wax overcoating.

Scrim-backed, coated foil—The first successful utilization of metallic foil for water-vapor barriers was comprised of 0.001 lead foil laminated with a special asphaltic blend or with resin to kraft paper, the foil being coated with about 30 lb. of polyvinyl butyral (Butvar) per ream. This combination was then laminated using a waterproof resin adhesive to cotton scrim to give strength and abrasion resistance. The function of the Butvar coating was threefold: to provide heat sealability; to reduce transmission rate where the foil might pin-hole or break, and to give extensibility to the foil thus permitting it to crease and form around covers and projections without fracture.

A successful variation of this combination was later developed by laminating 0.001-in. aluminum foil direct to scrim with polyvinyl chloride adhesive. A coating of polyvinyl chloride—usually about 20 lb. per ream—was also laid on the foil to accomplish the same function as Butvar on lead foil. This combination was of course much lighter and more pliable, although it lacked the additional strength of the paper ply, and the aluminum foil did not have the extensibility of lead. The MVTR of both these constructions averaged about 0.02 to 0.04 grams.

Paper-backed, coated foil—A natural development of the scrim-back foil barriers was the elimination of the cloth backing on the scrim-paper-asphalt-lead-foil combination. This simplified combination was found satisfactory for Method II packs constructed of an inner carton wrapped and sealed in the barrier with a close-fitting outer carton to prevent abrasion and puncture of the barrier.

Many attempts were also made to resin-laminate aluminum foil, with a light, heat-seal coating, to paper for this type of Method II package. Until the end of the war, however, when intensive laboratory testing was discontinued, none had survived the cycling tests, the point of failure being due to inadequate strength of the heat-sealed seams and closures and to delamination of the paper and foil.

Coated aluminum foil—One supplier was able to coat both sides of 0.002-in. aluminum foil with a heavy coating of transparent heat-sealable resin. This combination had an MVTR comparable to other foil combinations and was found satisfactory for carton-barrier-carton applications.

Saran[4]—This extruded polyvinylidene chloride was the only unsupported transparent film which consistently met all requirements for Method II packaging. In 0.002-in. gauge, its MVTR averaged 0.010 to 0.012, and it had the peculiar property of becoming more impermeable after aging. Saran, tested after several months of exposure, showed MVTR's of 0.060 to 0.080.

X-Crepe[5]—This was another proprietary product which found wide usage not only as a water-vapor barrier, but also as a waterproof case-liner material. It was composed of three plies of 30-lb. paper laminated together with a total of over 200 lb. of a special blend of asphalt and wax. The paper was so embossed to permit a stretch of over 20 per cent in any direction. X-Crepe was usually furnished in pouch form with about an inch strip of cold-sealing pressure-sensitive asphalt along the closing edges. The adhesive was protected against premature sealing by strips of cellophane. When the cellophane was removed, a tight seal was effected by pressing the edges firmly together. The MVTR of X-Crepe averaged about 0.22 g. but the relatively low cost of the material helped to offset the additional amount of desiccant which was required when X-Crepe was used.

Conclusion

Many of the materials discussed above will play an important part in postwar packaging. Although neither the hazards against which we had to protect material during the war, nor the costs that we were willing and able to pay will be repeated in our normal peace-time "logistics," still there will always be a need for the degree and kind of protection which these proven materials can provide.

Their significance lies in the proof they have afforded of what can be done to develop and produce materials to fit almost any predetermined standards of performance. Our war experience proved beyond question that once those standards are established, technicians in the packaging industry have the "know-how" and the ingenuity to find the materials or the combinations of materials which will do the job. What the packaging technicians are waiting for now is a clear definition from the users of just what performance will be demanded of lamination and coatings in a peacetime world.

[3] Complete details on the package test are included in the JAN-P-131.

[4] Saran—manufactured by Dow Chemical Company.

[5] X-Crepe—manufactured by Cincinnati Industries.

Flexible packaging materials

On the insert chart opposite p. 630 will be found factual information about the properties of a number of flexible packaging materials. It is not our aim to list all flexible materials, but merely to mention those which are representative enough to be tabulated in this way.

War limitations removed many materials from civilian use, among them rubber based materials and waxes having rubber as a modifying agent. Many other materials listed in the chart were limited by War Production Board orders to certain high priority applications. Today, with very few exceptions, governmental controls have been lifted. However, a few of them have been reinstated or persist where there is a serious shortage of the packaging material or of the substance from which it is made, as in the case of Pliofilm (rubber hydrochloride). Whether or not there is still a limitation order, few of the materials listed in the chart are available in unlimited supply today and this situation will probably persist to some degree until the end of 1946.

The general information given below concerning the properties and use of each of the important flexible packaging material groups will supplement the data found in the chart.

Regenerated cellulose films

These comprise the bulk of the transparent films in production today. They are transparent, colorless, slow burning and affected by changes of the humidity in the atmosphere. The fact that the base is hygroscopic or water-wettable, makes it possible to use the film for products having high fat content, but it also results in a film which has no moistureproofness.

The most widely used form of regenerated cellulose sheeting is that with a coating of moistureproof lacquer. The moistureproof film is used in much greater quantities than the uncoated film.

Because the functions of the resulting film are properties of the lacquer coating, it is possible, by varying the lacquer composition, to produce films having high or low moistureproofness and with or without heat-sealing properties. However, if the film is to be used in contact with free water, it is usually necessary to use a so-called anchored coating which is especially made to give better adhesion of the lacquer to the cellulose base.

Many of the modifications of cellulose films depend upon changes in the degree of plasticization to meet the needs of a particular product or packaging machine.

As a result of the demand for increased moistureproofness and greater toughness and strength, there has been a great increase in the volume of cellulose films laminated to each other or to other materials—paper, metal foils, etc. The addition of a suitable laminating agent can improve the physical properties markedly.

Cellulose acetate

Because of its good dimensional stability, high gloss and general durability, cellulose acetate, laminated to printed materials, is increasingly used for such items as window cartons. This material also appears to have great promise in the packaging of fresh produce because of its insensitivity to softening by water and its



1—A labeled cellophane package will attract the housewife. In a merchandising test shown here, the same brand of macaroni was presented in three different packages. The relative positions of the packages were shifted, but labeled cellophane wrap was best seller.

high rate of water-vapor transfer. It also possesses other physical properties which make it suitable for use in rigid transparent containers.

Cellulose acetate films differ radically from regenerated cellulose because the acetate base is water-insensitive and can only be put in solution by certain solvents. Its manufacture is more involved, and since its base material is usually cotton linters rather than wood pulp, it is higher in cost than regenerated cellulose. The acetate film is unusually brilliant and clear, but possesses no useful degree of moistureproofness. Because of the effect of some organic solvents on the film, and because of the poor adhesion of lacquer coatings, it is not usually lacquered, although the resulting film would have excellent moistureproofness.

Cellulose acetate has good stability against outdoor exposure and, when laminated to cotton scrims, has been used as a glass substitute.

Ethyl cellulose

Ethyl cellulose is extremely stable to alkalis, heat and light, and is extremely clear and inherently flexible. Its moistureproofness is about the same as cellulose acetate. Ethyl cellulose sheetings can be made moistureproof by the addition of suitable lacquers as surface coatings. Although the base material is stable when melted, the film is an extremely difficult one to heat seal except under special conditions. Ethyl cellulose is particularly well adapted for fabrication into rigid, transparent containers where its clarity and stability make it outstanding.

Rubber hydrochloride film

In several important ways, rubber hydrochloride film differs materially from the films previously described. First, its base is rubber and not cellulose; second, it is inherently moistureproof and capable of strong heat seals without added coatings.

Processes of manufacturing consist of adding hydrogen chloride gas to a special grade of crude rubber. The resulting resin is dissolved in solvents and placed on a moving web which is passed through a heating chamber to evaporate the solvents and thus leave a transparent film.

Rubber hydrochloride sheets are extremely tough and can be stretched to a higher degree than any of the cellulose-based films. In heavier gauges, the film is slightly cloudy. The stability of rubber films is poorer than cellulose films especially when they are exposed to heat and to direct sunlight.

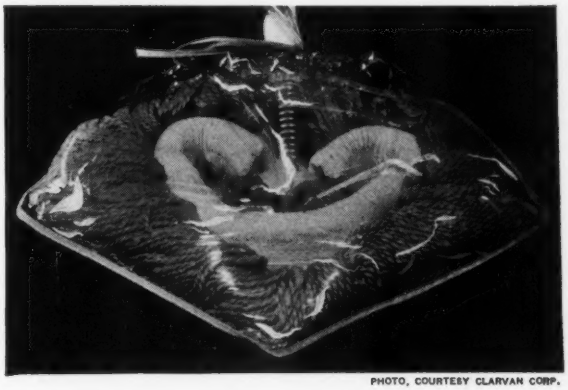
Since this film has the property of making strong welded seals, it offers possibilities for the packaging of certain liquids which could not be successfully packaged in any other film.

Rubber hydrochlorides are still being used for packaging of civilian aircraft engines and similar Method II packaging. However, as soon as natural rubber becomes available in increased quantities, this film can be expected to recapture its peacetime markets in cheese packaging and other fields where it has distinct advantages.



PHOTO, COURTESY E. I. DU PONT DE NEMOURS & CO., INC.

2—Cellophane permits inspection while making an attractive and protective wrap for Deejay poultry.



PHOTO, COURTESY CLARVAN CORP.

3—Here vinyl chloride-acetate transparent film adds sales appeal as well as protection to a dust mop.

Vinylidene-chloride films

The early production of vinylidene chloride films was chiefly confined to extruded tubes. Continued research and engineering have developed means of producing this material in roll form and also have evolved apparatus for effecting satisfactory heat seals.

Heat sealing of this material is not, however, a simple matter without such specialized equipment, because of the shrinkage characteristics of the material as manufactured. With new specialized sealing equipment, however, durable seams can be made.

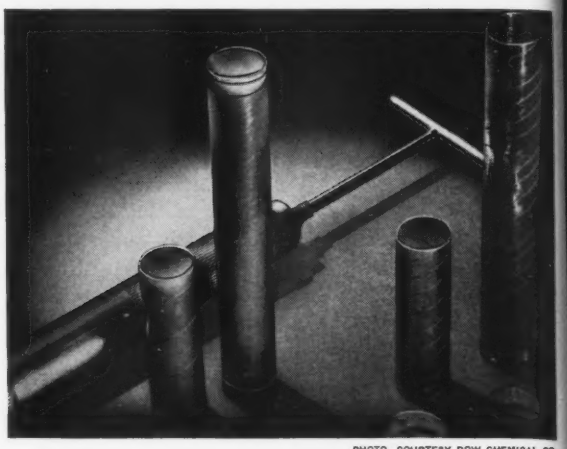
Vinylidene chloride films are manufactured by a very unusual process because the resin is nearly insoluble in common solvents and also because it does not lend itself to the usual calendering operations. The film is made by nearly simultaneously heating the resin and forcing it at great pressure (because of its viscosity), through a circular slit orifice. The extruded product is a thin-walled tube which must be cooled, oriented and slit to make a clear flat film.

This film has, inherently, the best resistance to water-vapor transmission of any transparent film and it is strong and durable even at sub-zero temperature.



PHOTO, COURTESY BAKELITE CORP.

4—Sharp corners will not penetrate the vinyl chloride film protecting this Ben Hur quick freezer.



PHOTO, COURTESY DOW CHEMICAL CO.

5—Spiral-wound containers of ethyl cellulose hold chemicals and act as cartridges for grease guns.

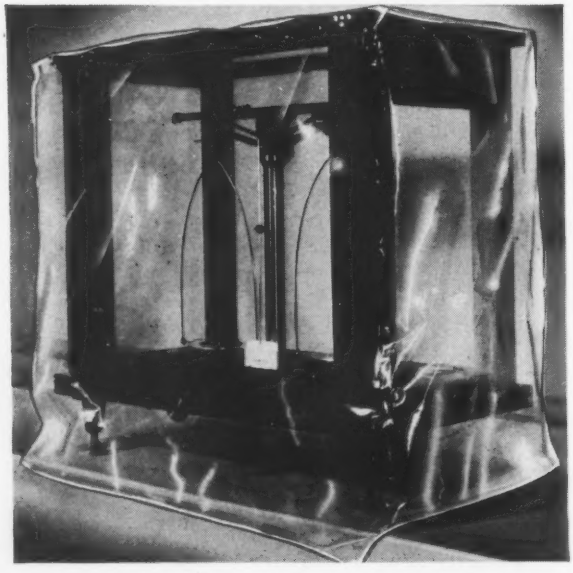
It is in limited production and is being used for special applications of Method II, packaging of metal parts and optical equipment using silica gel.

Vinyl films

The vinyl films are usually mixed polymers of either vinyl chloride or acetate, or copolymers of both. They are being made by two widely different methods. One process uses the familiar procedure of casting a film from solvent solutions of the resin followed by a careful removal of the solvent. The newer method is that of squeezing out a hot plastic film of the resin between two rolls and then allowing it to cool. This method is called "calendering" since the equipment is similar in appearance to conventional calender stacks.

6—Compar (polyvinyl alcohol film) protects delicate precision instruments from dust and fumes.

PHOTO, COURTESY RESISTOFLEX CORP.



The method of solvent casting has certain advantages. It can make very thin films, it can make films of a wider range of base resins, and the films which are produced by this method are completely transparent and have shiny surfaces.

The calendering process is limited by the thinness of the films it produces, the type of resin and the fact that the films are translucent to opaque depending upon their thickness. However, this process has the advantage of lower cost and less complex equipment. Both types of film have been used as durable, waterproof and easily heat-sealed barriers and covers. So far, no vinyl film of either type has been produced which has a useful level of water vaporproofness.

Polyvinyl alcohol

Films of polyvinyl alcohol have been laboratory curiosities and even now they are being produced only in very limited quantities and for very special uses.

This transparent film is unusual in that it is water soluble—as a matter of fact, it is made by casting a resin out of a water solution. The resulting film is exceptionally clear and brilliant and it has unusual strength properties in normal conditions of temperature and humidity. Since it is a hydrophilic (water soluble) material, it is, of course, completely impervious to oils and greases. Likewise it is very much affected by degrees of humidity.

Polyvinyl alcohol films can be made in two types: one soluble in cold water; the other soluble in hot water. As yet, no uses for this film have been announced. It will be interesting to see the importance which this water-soluble film will assume.

Polyethylene

Polyethylene film is being manufactured in increasingly larger quantities for various uses, particularly where waterproofness, chemical inertness and low levels

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PROPER

The values reported in this chart were obtained from various sources
Manufacturers should be consulted for addition

PROPERTIES	CELLULOSE DERIVATIVES			
	Cellophane Plain	Cellophane Moistureproof	Cellophane Moistureproof Anchored	Cellul
GENERAL				
Type of Material	Regenerated cellulose	Lacquered regenerated cellulose	Anchored, lacquered regenerated cellulose	Cellu
Forms Available	Sheets & rolls	Sheets & rolls	Sheets & rolls	She
Clarity	Transparent	Transparent	Transparent	Tra
Thickness Range, in.	0.0008–0.0015	0.0009–0.0017	0.0009–0.0017	0.00
Maximum Width, in.	44	44	44	
Area Factor, sq. in. per lb.	12,400–23,400	11,600–21,000	11,600–21,000	14,
Specific Gravity, approximate	1.45	1.40–1.55	1.40–1.55	1
MECHANICAL				
Tensile Strength, lb. per sq. in.	—	—	—	
Elongation, per cent	15–25	15–25	18–25	
Bursting Strength (Mullen) lb. per sq. in.	—	—	—	
Tearing Strength (Elmendorf), grams	2–10[1]	2–10[1]	2–10[1]	
Folding Endurance	—	—	—	
CHEMICAL				
Water Absorption in 24-hr. Immersion Test, per cent	High	High	Low (water repellent)	
Water-Vapor Permeability,[2] grams/24 hr./100 sq. in. at 100 deg. F. 95% R. H.	High	0.2–0.6	0.2–0.6	
Permeability to Gases	Moist: Low Dry: Impermeable	Immeasurable[3] Impermeable[3]	Immeasurable[3] Impermeable[3]	Im
Resistance to Acids	Poor resistance to strong acids	Poor resistance to strong acids	Poor resistance to strong acids	
Resistance to Alkalis	Poor resistance to strong alkalis	Poor resistance to strong alkalis	Poor resistance to strong alkalis	
Resistance to Greases and Oils	Impermeable	Impermeable	Impermeable	
Resistance to Organic Solvents	Insoluble	Insoluble	Insoluble	Solub hy
PERMANENCE				
Resistance to Heat (Limiting Temp.), ° F.	Begins to char at 375° F.	Begins to char at 300° F.	Begins to char at 300° F.	
Resistance to Cold (Limiting Temp.), ° F.	Depends on type and R. H.	Depends on type and R. H.	Depends on type and R. H.	
Resistance to Sunlight	No effect	No effect	No effect	
Dimensional Change at High R. H., per cent	3–5	3–5	3–5	
Resistance to Storage	Deterioration due to age is negligible, provided proper storage conditions are maintained			
Flammability	Same as newsprint	Same as newsprint	Same as newsprint	No
Manufacturers	E. I. du Pont de Nemours & Co., Inc. Sylvania Industrial Corporation			E. I Nemo Celan Amer Tenn

PROPERTIES			
	Vegetable Parchment	Wet-Strength Paper	Plain Glassine
GENERAL			
Type of Material	Practically pure cellulose	Paper with added resins	Physically treated p
Forms Available	Sheets & rolls, many weights & grades	Sheets & rolls	Sheets, continuous & converted produ
Clarity	Translucent to opaque	Opaque	Nearly transparen translucent & opa
Thickness Range, in.	0.0017–0.0075 (single)	0.0025–0.0070	0.00075–0.003
Maximum Width, in.			

PERTIES OF FLEXIBLE PACKAGING MATERIA

ous sources and are believed to represent acceptable commercial standards. Special grades of some of these materials may
or additional or specific information or for new uses of their materials. See also chart on properties of Metal Foils and Fo

TIVES		SYNTHETIC RESINS			
Cellulose Acetate	Ethyl Cellulose	Vinyl Films Vinyl Chloride or Vinyl Cl and Ac.[4]	Vinyl-Coated Paper[4]	Saran	
Cellulose acetate	Ethyl cellulose	Vinyl resins	Vinyl resins on paper	Polyvinylidene chloride	hy
Sheets & rolls	Sheets & rolls	Rolls	Rolls	Seamless tubes, rolls	Continu
Transparent	Transparent to opaque	Transparent to translucent	Opaque	Transparent	Transp
0.00088–0.0015	0.001–0.020	0.001 or more	Resin 0.001 or more	0.00125–0.00225	Norma Tensili
48	25	40	40	24	
14,600–25,000	24,300 or less	2,300 or less	—	7,200 – 13,000	2
1.25–1.35	1.14	1.14	1.40	1.68	
—	10,000	—	—	7,000–11,000	Yie Ultim
20–35	30	—	—	25–35	Ulti
—	48	—	—	67	
2–5	7	—	—	40	
—	4,000	—	—	Over 500,000	10,000–1
3.5–8.0	2.6	Negligible	—	None	0.6–1
High	High	High	High	0.20 or less	
Low[3] Impermeable[3]	Depends on R. H.	—	—	Very low	6–85 cc. 100 hr. at 100–1,500 c 100 hr. at
Poor	Weak and fair	Good	Good	Excellent, except H_2SO_4 and HNO_3	
Poor	Excellent	Good	Good	Good except NH_4OH	
Good	Good	Good	Good	Excellent	
Soluble, except in hydrocarbons	Soluble	Soluble in some	Soluble in some	Good	Solubl chlorina
150° F.	275° F.	Softens at 200° F., melts at 230–295° F.	180° F.	170° F.	
—	−75° F.	—	−40° F.	−20° F.	
Good	Excellent	No effect	Good	Excellent	
Slight	Very slight	None	—	None	
Good	Excellent	No change	Good	Good	Good
Nonflammable	Moderate	Slow burning	Slow burning	Self-extinguishing	Sl
E. I. du Pont de Nemours & Co., Inc. Celanese Celluloid Corp. American Products Mfg. Co. Tennessee Eastman Corp.	Dow Chemical Co.	B. F. Goodrich Co. Carbide & Carbon Chemicals Corp. Goodyear Tire & Rubber Co.		Dow Chemical Co.	Goodyear

PAPER PRODUCTS					
n Glassine	Lacquered Glassine	Waxed Glassine	Laminated Glassine[5]	Laminated Glassine[5]	
y treated paper	Coated physically treated paper	Coated physically treated paper	2-Ply physically treated paper	3-Ply physically treated paper	
ontinuous rolls erted products	Sheets, continuous rolls & converted products	Sheets, continuous rolls & converted products	Sheets & continuous rolls	Sheets & rolls	
transparent to cent & opaque	Transparent and opaque	Nearly transparent and opaque	Translucent and opaque	Translucent to opaque	
0075–0.003	0.0008–0.002	0.0008–0.003	0.002 and up	0.00	

	opaque		translucent & opaque
Thickness Range, in.	0.0017–0.0075 (single)	0.0025–0.0070	0.00075–0.003
Maximum Width, in.			

S OF FLEXIBLE PACKAGING MATERIA

lieved to represent acceptable commercial standards. Special grades of some of these materials may
c information or for new uses of their materials. See also chart on properties of Metal Foils and Fo

	SYNTHETIC RESINS			
Ethyl Cellulose	Vinyl Films Vinyl Chloride or Vinyl Cl and Ac.[4]	Vinyl-Coated Paper[4]	Saran	
Ethyl cellulose	Vinyl resins	Vinyl resins on paper	Polyvinylidene chloride	hyd
Sheets & rolls	Rolls	Rolls	Seamless tubes, rolls	Continuo
Transparent to opaque	Transparent to translucent	Opaque	Transparent	Transpa
0.001–0.020	0.001 or more	Resin 0.001 or more	0.00125–0.00225	Normal Tensiliz
25	40	40	24	
24,300 or less	2,300 or less	—	7,200 – 13,000	24,
1.14	1.14	1.40	1.68	
10,000	—	—	7,000–11,000	Yiel Ultim
30	—	—	25–35	Ultir
48	—	—	67	
7	—	—	40	
4,000	—	—	Over 500,000	10,000–1,
2.6	Negligible	—	None	0.6–1.
High	High	High	0.20 or less	
Depends on R. H.	—	—	Very low	6–85 cc. 100 hr. at 100–1,500 cc 100 hr. at
Weak and fair	Good	Good	Excellent, except H_2SO_4 and HNO_3	
Excellent	Good	Good	Good except NH_4OH	
Good	Good	Good	Excellent	
Soluble	Soluble in some	Soluble in some	Good	Soluble chlorinat
275° F.	Softens at 200° F., melts at 230–295° F.	180° F.	170° F.	
−75° F.	—	−40° F.	−20° F.	
Excellent	No effect	Good	Excellent	
Very slight	None	—	None	
Excellent	No change	Good	Good	Good
Moderate	Slow burning	Slow burning	Self-extinguishing	Sl
Dow Chemical Co.	B. F. Goodrich Co. Carbide & Carbon Chemicals Corp. Goodyear Tire & Rubber Co.		Dow Chemical Co.	Goodyear

PAPER PRODUCTS				
cquered Glassine	Waxed Glassine	Laminated Glassine[5]	Laminated Glassine[5]	
oated physically treated paper	Coated physically treated paper	2-Ply physically treated paper	3-Ply physically treated paper	
s, continuous rolls nverted products	Sheets, continuous rolls & converted products	Sheets & continuous rolls	Sheets & rolls	
parent and opaque	Nearly transparent and opaque	Translucent and opaque	Translucent to opaque	
0.0008–0.002	0.0008–0.003	0.002 and up		

nsparent to t & opaque	Transparent and opaque	Nearly transparent and opaque	Translucent and opaque	Translucent to opaque
5–0.003	0.0008–0.002	0.0008–0.003	0.002 and up	

RIALS

erials may be obtained which excel in some particular property.

oils and Foil Laminations, opposite p. 646.

RUBBER BASE PRODUCTS		MODIFIED WAXES	
Pliofilm	Cry-O-Vac	Hot-Melt Coatings	Hot-Melt Laminants
Rubber hydrochloride	Latex film used for frozen foods	Wax & film formers coated on paper & foils	Wax & film formers between papers
Continuous rolls & sheets	Unexpanded bags Expanded bags	Continuous rolls & sheets	Continuous rolls & sheets
Transparent to opaque	Transparent	Translucent to opaque	Translucent to opaque
Normal 0.0008–0.00225 Tensilized 0.0002–0.0004	Unexpanded 0.018–0.020 Expanded 0.0015–0.002	0.002–0.030	0.004–0.030
48	For 1-lb. to 400-lb. packages	36	55
24,000 or less	—	—	—
1.12–1.15	0.935	—	—
Yield 2,300–4,000 Ultimate 5,500–7,500	15,000 at 40° F. (expanded film)	—	—
Yield 10–20 Ultimate 350–500	1,200	—	—
—	—	—	—
—	—	—	—
10,000–1,000,000 (M. I. T.)	—	—	—
0.6–1.3 at 75% R. H.	Negligible	—	—
0.5–1.0	Very low	0.3–1.0	0.2–1.0
6–85 cc. of air/100 sq. in./ 100 hr. at 100° F. & 760 mm. 00–1,500 cc. of CO_2/100 sq. in./ 100 hr. at 100° F. & 760 mm.	Permeable to CO_2; negligible to other common gases	Low to high	Low to high
Good	Good	—	—
Good	Good	—	—
Good	Excellent below 30° F.	Fair to good	Fair to good
Soluble in aromatic & chlorinated hydrocarbons	Soluble except in alcohols, ketones and ethers	Soluble in some aromatic & aliphatic hydrocarbons	Soluble in some aromatic & aliphatic hydrocarbons
160° F.	Heat shrinks expanded bag to size of package	—	—
−50° F.	−50° F.	—	—
Fair	—	—	—
Slight	Negligible	—	—
Good if kept in dark	Excellent at 40° F. and below	—	—
Slow burning	Slow burning	—	—
Goodyear Tire & Rubber Co.	Dewey & Almy Chemical Co.	Many specialty manufacturers and converters	

ed [4]	Plain Greaseproof	Kraft Paper[5]	Laminated Kraft[6]
ally per	Mechanical parchment	—	Laminated kraft paper for liners
olls	Sheets, continuous rolls & converted products	Rolls & sheets	Rolls & sheets
t to	Translucent and opaque	Opaque	Opaque
	0.001–0.004		

PROPERTIES	Vegetable Parchment	Wet-Strength Paper	Plain Glassine
GENERAL			
Type of Material	Practically pure cellulose	Paper with added resins	Physically treated pape
Forms Available	Sheets & rolls, many weights & grades	Sheets & rolls	Sheets, continuous roll & converted products
Clarity	Translucent to opaque	Opaque	Nearly transparent t translucent & opaque
Thickness Range, in.	0.0017–0.0075 (single)	0.0025–0.0070	0.00075–0.003
Maximum Width, in.	90	88	70
Area Factor, sq. in. per lb.	3,600–21,600(25-120 lb.)	14,400 and up	7,200–34,000
Specific Gravity, approximate	—	—	—
PHYSICAL TEST DATA			
Tensile Strength, lb. per sq. in.	High wet strength	High wet strength	—
Elongation, per cent	M.D. 2-4% C.D. 4-15%	—	—
Bursting Strength (Mullen) lb. per sq. in.	13–65 for dry-reg. types[7]	(Dry) 80% of basis weight (Wet) 30–60% of dry test	10–50
Tearing Strength (Elmendorf), grams	Sulfites 60-80% b.w. Sulfates 100-130% b.w.	35–50 and up	6–40
Folding Endurance	High	—	—
CHEMICAL			
Water Absorption in 24-hr. Immersion Test, per cent	Up to 150%, but insoluble	High, but insoluble	Medium
Water-Vapor Permeability,[2] grams/24 hr./100 sq. in. at 100 deg. F. 95% R. H.	High if not specially treated	High	High
Permeability to Gases	Impermeable to most gases	Permeable	Low
Resistance to Acids	Varies[3]	Fair	Moderate
Resistance to Alkalis	Varies[3]	Poor	Poor
Resistance to Greases and Oils	Fair to excellent; insoluble	Poor	Good
Resistance to Organic Solvents	Excellent	Absorbs	Good
PERMANENCE			
Resistance to Heat (Limiting Temp.), ° F.	200° F. dry; any temp. wet[5]	200° F. dry; any temp. wet	150–240° F.
Resistance to Cold (Limiting Temp.), ° F.	—	Good	−20° F.
Resistance to Sunlight	Good	Good	Good
Dimensional Change at High R. H., per cent	Expands, stretches across grain, depends on type	Considerably less than ordinary paper	Slight
Resistance to Storage	Good	Good	Good
Flammability	Similar to paper	Similar to paper	Similar to paper
Manufacturers	Kalamazoo Vegetable Parchment Co. Paterson Parchment Co.	Can be made by any paper mill	Brownville Paper Co. Deerfield Glassine Co. Glassine Paper Co. Hamersley Mfg. Co. Hartford City Paper C Mountain Mill Corp. Nicolet Paper Corp. Oregon Pulp & Paper C Rhinelander Paper Co Riegel Paper Corp. Thilmany Pulp & Pa Co. Westfield River Paper C

[1] Figures represent pull required to continue tear after starting. Force required to start tear is too high to measure on same e
[2] Using $CaCl_2$ in Test Dish; method is described in ANC67 Army-Navy Specification.
[3] Depends on amount of moisture present, solubility of gas in water, water vaporproofness of film and vapor pressure differenti
[4] Vinyl chloride or chloride-acetate polymers, either formed or applied from solvent solutions or by calendering hot fluid resin.
[5] Waxy lamin nt.

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lassine	Lacquered Glassine	Waxed Glassine	Laminated Glassine[5]	Laminated Glassine[5]
reated paper	Coated physically treated paper	Coated physically treated paper	2-Ply physically treated paper	3-Ply physically treated paper
inuous rolls d products	Sheets, continuous rolls & converted products	Sheets, continuous rolls & converted products	Sheets & continuous rolls	Sheets & rolls
nsparent to t & opaque	Transparent and opaque	Nearly transparent and opaque	Translucent and opaque	Translucent to opaque
5–0.003	0.0008–0.002	0.0008–0.003	0.002 and up	0.003 or more
0	52	70	52	52
34,000	9,600–20,600	6,600–28,800	9,500 and less	6,200 or less
–	—	—	—	—
–	—	—	—	—
–	—	—	—	—
-50	10–25	8–40	26 and up	40 or more
40	6–20	5–38	20 and up	30 or more
–	—	—	—	—
lium	Moderate	Very low	Medium	Medium
gh	0.2–1.0	0.2–1.0	0.2–1.0	0.1–0.2
ow	Low	Low	Low	Very low
erate	Moderate	Moderate	Moderate	Moderate
oor	Good	Good	Poor	Poor
ood	Good	Excellent	Excellent	Excellent
ood	Poor	Good	Good	Good
40° F.	150–300° F.	Heat sealing	130–150° F.	130–150° F.
0° F.	−20° F.	−20° F.	Depends on plasticizer	Depends on plasticizer
ood	Good	Good	Good	Good
ight	Slight	Slight	Slight	Slight
ood	Good	Good	Good	Good
to paper	Inflammable	Inflammable	Inflammable	Inflammable
Paper Co.	Hartford City Paper Co.	Deerfield Glassine Co.	Deerfield Glassine Co.	Glassine Paper Co.
lassine Co.	Hazen Paper Co.	Glassine Paper Co.	Glassine Paper Co.	Riegel Paper Corp.
per Co.	Rhinelander Paper Co.	Hamersley Mfg. Co.	Hamersley Mfg. Co.	Rhinelander Paper Co.
Mfg. Co.	Riegel Paper Corp.	Oregon Pulp & Paper Co.	Hazen Paper Co.	Westfield River Paper Co.
ity Paper Co.	Westfield River Paper Co.	Rhinelander Paper Co.	Rhinelander Paper Co.	
Mill Corp.		Riegel Paper Corp.	Riegel Paper Corp.	
er Corp.		Thilmany Pulp & Paper Co.	Thilmany Pulp & Paper Co.	
p & Paper Co.		Westfield River Paper Co.	Westfield River Paper Co.	
r Paper Co.				
r Corp.				
Pulp & Paper Co.				
iver Paper Co.				

re on same equipment and therefore is not normally determined.

re differential.
t fluid resin.

[6] Values depend on pulp and other factors. Similar but somewh
[7] Wet types are 50-60% of the dry Mullen values.
[8] Depends largely on strength, time and temperature.
[9] Time is a main factor.

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quered Glassine	Waxed Glassine	Laminated Glassine[5]	Laminated Glassine[5]	
ated physically treated paper	Coated physically treated paper	2-Ply physically treated paper	3-Ply physically treated paper	
s, continuous rolls nverted products	Sheets, continuous rolls & converted products	Sheets & continuous rolls	Sheets & rolls	
parent and opaque	Nearly transparent and opaque	Translucent and opaque	Translucent to opaque	
0.0008–0.002	0.0008–0.003	0.002 and up	0.003 or more	
52	70	52	52	
9,600–20,600	6,600–28,800	9,500 and less	6,200 or less	
—	—	—	—	
—	—	—	—	
—	—	—	—	
10–25	8–40	26 and up	40 or more	
6–20	5–38	20 and up	30 or more	
—	—	—	—	
Moderate	Very low	Medium	Medium	
0.2–1.0	0.2–1.0	0.2–1.0	0.1–0.2	
Low	Low	Low	Very low	
Moderate	Moderate	Moderate	Moderate	
Good	Good	Poor	Poor	
Good	Excellent	Excellent	Excellent	
Poor	Good	Good	Good	
150–300° F.	Heat sealing	130–150° F.	130–150° F.	
−20° F.	−20° F.	Depends on plasticizer	Depends on plasticizer	
Good	Good	Good	Good	
Slight	Slight	Slight	Slight	
Good	Good	Good	Good	
Inflammable	Inflammable	Inflammable	Inflammable	
ord City Paper Co. Paper Co. lander Paper Co. Paper Corp. ield River Paper Co.	Deerfield Glassine Co. Glassine Paper Co. Hamersley Mfg. Co. Oregon Pulp & Paper Co. Rhinelander Paper Co. Riegel Paper Corp. Thilmany Pulp & Paper Co. Westfield River Paper Co.	Deerfield Glassine Co. Glassine Paper Co. Hamersley Mfg. Co. Hazen Paper Co. Rhinelander Paper Co. Riegel Paper Corp. Thilmany Pulp & Paper Co. Westfield River Paper Co.	Glassine Paper Co. Riegel Paper Corp. Rhinelander Paper Co. Westfield River Paper Co.	

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	Plain Greaseproof	Kraft Paper[8]	Laminated Kraft[8]
ly r	Mechanical parchment	—	Laminated kraft paper for liners
s	Sheets, continuous rolls & converted products	Rolls & sheets	Rolls & sheets
to	Translucent and opaque	Opaque	Opaque
e	0.001–0.004	0.002–0.009	—
	160	30	40
	7,200–25,400	4,600–16,600	4,150–5,200
	—	0.65	—
	—	35% of basic wt.	—
	—	2–5	—
	10–60	30% of basic wt.	50–60
	8–45	2 pt. per lb. of basic wt.	—
	—	10 double (Schopper)	—
	High	High	High
	High	High	1–5
	Moderate	Permeable	Permeable
	Good	Poor	Poor
	Poor	Poor	Poor
	Good	Poor	Poor
	Good	Not resistant	Poor
	150–240° F.	200° F.	150° F.
	−20° F.	—	Good
	Good	Colors will fade	Excellent
	Slight	M. D. approx. 0.5% C. D. approx. 1.5%	Considerable
	Good	Avoid dampness, high heat & low humidity	Good
e	Similar to paper	Burns readily	Burns readily
per r Paper iver	Deerfield Glassine Co. Glassine Paper Co. Hamersley Mfg. Co. Hartford City Paper Co. Kalamazoo Vegetable Parchment Co. Nicolet Paper Corp. Oregon Pulp & Paper Co. Rhinelander Paper Co. Riegel Paper Corp. Thilmany Pulp & Paper Co.	Thilmany Pulp & Paper Co. Union Bag & Paper Corp.	

but somewhat lower mechanical values apply to sulfite paper.

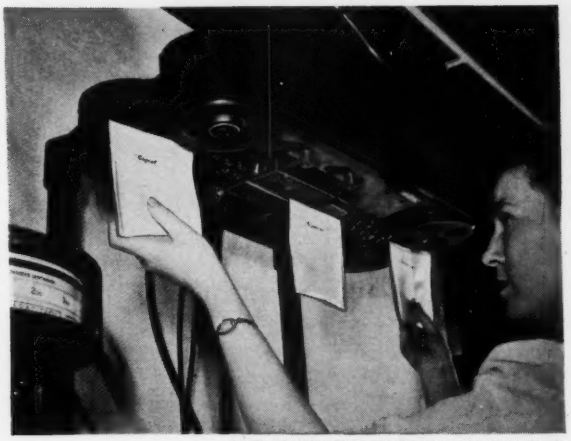
.

of in any form.



PHOTO, COURTESY GOODYEAR TIRE & RUBBER CO.

7—Rubber hydrochloride film, inherently moisture-proof, makes a strong heat seal without coatings.



PHOTO, COURTESY POLYMERIZATION DIV., DOW CHEMICAL CO.

8—Test bags, coated with vinylidene chloride latex are heat sealed in a continuous belt sealing unit.

of odor and taste are important characteristics. This film can be produced by any one of three processes: casting from a solvent solution, calendering or extrusion. The latter is similar to calendering, except that the hot plastic mass of resin is forced through a straight or circular orifice of carefully controlled dimensions. This resin is available in large quantities because of the production facilities which were set up during the war for manufacture of the resin for electrical insulation purposes. It is being produced in large quantities from ethylene obtained from petroleum cracking and as a component in natural gases.

Polyethylene, in general, is characterized by its extreme toughness and rubberiness and by its excellent electrical properties. The film cast from solution is slightly cloudy, and calendered film is translucent.

Theoretically, polyethylene, because of chemical composition and molecular weight, should be extremely resistant to moisture absorption and water-vapor penetration. However, samples of the film have not shown the extremely low water-vapor permeability which has been expected of them. For example, a film of $1^1/_2$ mils in thickness made by the casting process shows a transmission rate of approximately 0.6 while a 3-mil film shows a transmission rate of approximately 0.25 g. per 100 sq. in. at 100 deg. F., 95 per cent R.H.

Polyethylene sheeting can be heat sealed at about 250 deg. F. to make welded joints which are strong and have functions similar to the original sheeting. These films are too new to have found any large or important applications, but technological improvements in polyethylene sheeting can be expected as well as new uses to which it will be uniquely adapted.

Paper products

Paper is almost always used to provide strength and durability, or as a base for printing or surface coatings. The only two papers which in themselves have other functions are glassine and parchment which are inherently greaseproof and, to some degree, flavortight. Actually, parchment gains these properties after leaving the paper machine. Glassine therefore is the only one which, per se, performs some chemical function.

Paper is a low-cost medium for obtaining mechanical properties, and it can provide an attractive surface for printing and decoration. With the exception of glassine, all chemical properties must come from additional treatments or materials or they must be the result of combinations with other films.

The mechanical properties of papers vary widely depending upon the source and treatment of the pulp, the paper-machine operation, the calendering operations and the ream weight of the finished paper. Papers other than glassine are not efficient bases for many kinds of coating operations without such additional surface treatments as sizing, pre-coating, calendering or the addition of pigmental mixtures (coated papers). To produce surface or intact films, paper coatings or laminating agents must possess thixotropic (anti-penetrating) properties unless saturation of the paper base and use of relatively large amounts of agent are not deterring factors. (Dry wax or asphalt-saturated papers.)

Unfortunately, the saturation of the paper base causes the paper to develop some of the physical properties of the agent used. This results in loss of flexibility and perhaps of some strength factors.

Paper to paper combinations or paper coatings do not, in most cases, have extraordinary chemical functions. Glassine or parchment, however, may be laminated or may be coated with relatively small amounts of agent to produce structures of excellent chemical properties. Glassine and parchment are efficient in this respect because most agents behave similarly to oils, and these papers are not penetrated by, and do not absorb oil. With proper techniques and equipment they may be combined with papers to produce structures approaching the function and efficiency of all-glassine and parchment sheets.

XUM

Waxed papers

Historically, waxed paper precedes most of the flexible packaging materials in use today. The unit consumer package—especially for foods—became practical with the advent of the heat-sealing wrapping machine many years ago (see p. 730). Increasing use of waxed paper may reasonably be expected to continue, for many new developments in papermaking, new combinations of wax with other materials for coating or laminating and new improvements in printing, all point to better and more varied wrappers produced at relatively low cost.

Papers which may be waxed are: greaseproof krafts, manilas, tissues, twisting papers of several grades, regular and opaque sulfites and glassines. Waxed papers may be made opaque or highly transparent depending on needs. A paper stock may be waxed in a number of ways. It may be waxed either lightly or heavily, on one side only or on both sides of the sheet—with or without much penetration; or the sheet may be impregnated with wax as desired.

Colorful, attractive designs can be printed economically on waxed paper to provide excellent product identity. A high gloss wax finish further enhances the appearance of the package.

Present methods of producing and applying wax eliminate odors and safeguard the product against contamination from outside odors. The wax itself imparts no off-taste to foods. It is not a host to mold or yeast spores. Furthermore, waxed paper withstands climatic changes, keeping moist products moist, and dry products dry over long periods of time.

For the protection of consumer food units, waxed paper is the most widely used flexible, heat-sealing, packaging material. It not only protects and displays great quantities of foodstuffs in stores and in transit, but serves also, on an increasingly large scale, to protect foods once they are opened. It is extensively used by butchers as an inner wrap for meat, to seal in the juices and to ensure a leakproof package.

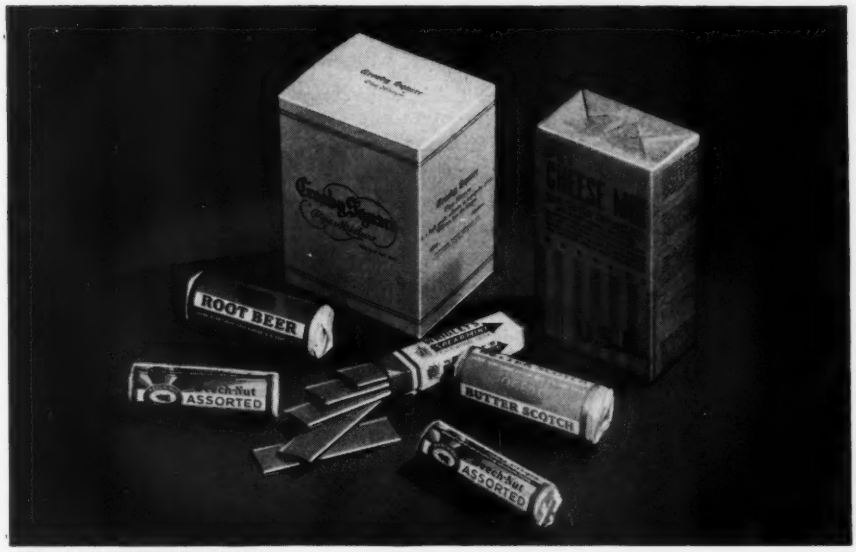
While the protection of food is the primary function of waxed paper, it is not by any means the only one. In various combinations, waxed paper is used to protect furniture and metal parts, and in lesser amounts, it is used in other widely diversified fields.

Waxed paper is more widely accepted than many other materials because, in various combinations, it can do so many things well at much less cost than can usually be accomplished in any other manner. Because waxed paper is not one standardized sheet, but is often custom built for the end use, it can fill a great variety of needs. The waxed paper manufacturer keeps in mind the factors which are important for a particular end use, and does not build unnecessary qualities into a sheet if they add to the cost. This is one of the outstanding features of waxed paper, as the consumer can purchase a sheet having the weight, strength and protective properties he wants without paying for a standardized construction or type of sheet in which would

PHOTO, COURTESY WAXED PAPER INSTITUTE



1—Meat often makes the trip from store to kitchen with bread and other groceries. Waxed paper wrapping prevents contamination by meat juices and grease; saves untidiness when housewife unpacks; and makes for sanitary handling at home and in store.



2—Waxed paper lends itself to the protection of a wide range of products. In packages of varied structure, tobacco, cheese mix, chewing gum and hard candies will retain their original freshness.

PHOTOS 2, 3 AND 4, COURTESY MARATHON CORP.

be incorporated all the desirable features possible, at a resulting higher price.

On the other hand, standardization of cartons has proved an important factor in the development of printed overwraps. Manufacturers who stock three or four carton sizes may perhaps have a hundred or more different outer wraps printed. These provide positive protection for freshness and result in highly attractive economical packages. Four colors are now commonly seen on such wraps. Fine, high quality printing procedures give the outer wrap the appearance of a printed carton, but at considerably less cost. Should printed cartons be preferred, however, a plain waxed paper can be used as a liner to protect the freshness of the product. Waxed glassines, krafts or sulfites are placed as sheets or die-cut forms, by hand, or automatically cut from rolls and inserted by the carton-forming machine. An electric eye control may be used for accurate cutting or registration.

Properties of waxed papers

A satisfactory flexible protective packaging material used in wrapping or lining consumer units must have at least some of the following qualifications: low cost, good heat-sealing qualities, extensibility, water-vapor-proofness, greaseproofness, waterproofness, high gloss, nonscuffable surface, nontoxic qualities, stability at normal temperatures, strength and stability of dimension. Other qualities which are of occasional but not general importance are such properties as alkaliproofness and acidproofness. An examination of the primary qualities usually desired in waxed paper will show just why it is so extensively used.

Low cost—Generally speaking, waxed paper is one of the lowest-cost protective wrappings. Comparatively inexpensive paraffin wax can be applied to paper at higher speeds than solvent coatings. Wax, being a hot melt, is 100 per cent usable, whereas only the solids of solvent type coatings are deposited on the paper. In the latter case, the usually costly solvents are lost entirely or, at best, recovered only by a very expensive process.

Heat-sealing qualities—In automatic machine wrapping a heat seal is not only superior and faster, but does not require the expense of adhesives, tapes or other methods of closure. Ordinary paraffin wax usually makes a satisfactory heat seal, sufficiently strong for most purposes such as on a bread wrapper or carton wrapper. If additional heat-sealing strength is required, it can be had by the blending of paraffin wax with microcrystalline waxes, certain resins, latex and similar compounds. Much progress has been made in this regard in recent years, and further advances are logically to be expected.

Extensibility—Paraffin wax is not extensible to an appreciable degree. This means that it has a tendency to crack rather than stretch on a fold. Because of this factor, a flat unfolded waxed sheet offers more protection than one which has been folded. The objections to

3—Many frosted food packages, refrigerated throughout distribution, are protected by outer wax wraps.



the folded sheets can be largely overcome by two sheets of glassine laminated with microcrystalline wax, either alone or in combination. A laminated sheet will withstand a fold test better than a single surface coated sheet. Here again, considerable progress has been made in research and development in an endeavor to make surface coatings of wax blends of various kinds that will make the folded sheet more protective.

Water-vaporproofness—Waxed papers are made which, while not approaching the tin can or the glass bottle in water-vaporproofness, have excellent protective properties. This protection is ample for the uses to which they are generally put. It is interesting to note that adding wax, even in small amounts, to certain solvent type lacquers and coatings is one of the best ways of bringing out water-vaporproof qualities in a lacquer or coating which otherwise, would have little to offer in this regard.

Greaseproofness—Wax is not by itself greaseproof, but if greaseproofness is desired, the wax is applied to paper which is, in itself, greaseproof. Papers most generally used for this purpose are glassines, greaseproofs and vegetable parchments, which are oftentimes waxed to impart qualities other than that of greaseproofness.

Waterproofness—A waxed paper in order to be waterproof, should be surface coated with an unbroken film, to cover completely the surface end fibres of the base sheet. Surface-coated, wax-laminated papers have excellent properties in this regard. On a surface-coated waxed paper, the point most likely to fail a waterproof test is the fold as mentioned under the discussion concerning extensibility, for, in this case, the film is apt to be broken. Even this objection is often overcome by applying the wax to high wet-strength sheets. The development of melamine treated papers of high wet strength during the war will undoubtedly result in new fields and big improvements for the waxed paper converters.

High gloss—A glossy, lustrous finish on an outside wrapper adds considerable sales appeal. Wax, properly applied and properly cooled on a smooth base sheet—preferably super calendered—gives a nice sheen or gloss.

4—Dry cereal products remain dry when the packager uses a waxed paper inner wrap for his carton.



If still greater gloss is desired, it will result from proper compounding of wax with certain resins. This is another case where continued research and development should show marked results.

Nonscuffable surface—The fact that wax coatings are easily marred is not objectionable for most of the uses to which they are put. Where a nonscuffable surface is important, it can be obtained by proper blending of wax and resins, which may be applied by a waxed paper manufacturer with hot melt equipment.

Nontoxic qualities—One of the best things about wax is that it is nontoxic. It is odorless, tasteless and is not a breeding ground for mold or yeast spores. These factors are vitally essential to any coating material which comes in direct contact with food of any kind. The variety of food products packaged in waxed paper attests to its perfect record on this score.

Stability at normal temperatures—Many films and coatings do not age well. This is not true of wax as applied to paper, for wax, under normal conditions, is very stable.

Strength—The strength of waxed paper depends largely on the base paper used. Minimum strength factors are determined for a particular end use, and the paper selected to meet these minimum requirements is so waxed as to give the other qualities desired. Grades of paper with varying degrees of strength range from light florist tissues to strong, tough krafts, or laminated krafts. This point well illustrates the flexibility of types of waxed paper tailored for particular end uses.

Stability of dimension—Wax coated papers have little tendency to expand or contract with changes of temperature or humidity. There is a slight difference between grades and weights of paper, as to amount of contraction or expansion under adverse conditions. For this reason, laminated waxed papers are often two papers of the same kind, so the slight contraction or expansion will be equal, resulting in a flat sheet. If the coefficient of expansion is different between two papers, the resulting laminated sheet has a tendency to curl.

There are several other flexible mediums having excellent characteristics, some of which are superior to any waxed paper combination for certain specific end uses, but the product to be protected often cannot bear the additional cost of these more expensive materials. As long as waxed paper continues to fill a need at low cost and in an eye-appealing manner, as is the case when it is well printed and well designed, the demand for it will be considerable.

The packaging picture is especially bright for waxed paper in those fields of food packaging where the unit cost is low and the turnover is rapid. On items of low cost, low margin of profit and quick turnover, such as bread, biscuits, crackers, cereals and frozen foods, waxed paper is used in far greater amounts than any other packaging material. This is because waxed paper is not only a low cost protective material, but permits brilliant display and easy identification when economically printed by multicolor letterpress, gravure or aniline printing.

Vegetable parchments

by J. R. Dufford

The discovery of vegetable parchment in 1853 came, like that of many other necessities of today, by accident. It has been attributed to W. E. Gaine, an Englishman, who is reputed to have prepared a sheet of cotton rag paper made by hand for use in demonstrating a lecture. While examining the sheet, it accidentally fell into a receptacle containing sulfuric acid. On recovering the sheet, much to his surprise, he found that the sheet of handmade cotton rag paper had taken on an entirely new form. Instead of being a porous absorbent and opaque sheet of paper, that which he held in his hand was translucent. By further experimenting he found that no amount of soaking in water, or even boiling, had any effect on the product of this happy accident.

At first Gaine's Paper, as it was called, was treated as a scientific curiosity, and its extraordinary properties were described before the Royal Society of London by Bailow in the year 1857. Several years elapsed, however, before vegetable parchment was produced on a commercial scale in a factory for handmade paper established in London by Warren de Larue in 1861. Several years later the paper was produced also at Stowford Mills.

From these beginnings, the manufacture of vegetable parchment gradually spread throughout Europe. It was introduced in America in 1885 by Paterson Parchment Paper Company.

The preparation of vegetable parchment consists of two separate and distinct processes. The first is that of manufacturing the base paper called waterleaf. In order that the second process, that of parchmentizing, may be effectively conducted, it is necessary to exercise great care in the selection of raw materials entering into the waterleaf.

It has been fully established that the most pure cellulose produces the best results. Waterleaf for vegetable parchment differs from most papers in that it does not contain sizing or loading materials. Small quantities of either of these substances seriously impair the parchmentizing of the waterleaf to which they have been added. As the resultant finished vegetable parchment is in a large measure dependent upon the quality of the waterleaf, it is clear that the processing of the waterleaf itself will require the utmost care if a satisfactory parchment is to be made.

For many years cotton rags constituted the principal raw material for waterleaf manufacture. However, with the advent of high alpha cellulose type pulps, this material almost completely supplanted cotton rags as a raw material for waterleaf manufacture. Special types which require a very high-grade cotton rag or a high-grade cotton linter are still produced. Beating, jordaning and other refining operations are accurately controlled and measured by various methods which have been found through the procedure of trial and error, to give waterleaf of suitable quality.

Parchmentizing operation

The second process in the manufacture of vegetable parchment is that of parchmentizing. This process renders the finished product entirely different from other papers. When properly prepared waterleaf is subjected to the action of sulfuric acid under suitably regulated conditions, a peculiar reaction occurs. This reaction is effected through the power of sulfuric acid to convert cellulose into a gelatinous mass called amyloid. Thus, in the presence of sulfuric acid the fibres of waterleaf are attacked and a coating or film of gelatinous cellulose is formed, covering the fibres and filling the interstices of the sheet, cementing or bonding the fibres into a coherent mass which is not defibred on subsequent immersion or even on boiling in water.

During the parchmentizing operation, opportunity is available to alter the normal condition of the paper in regard to pH or acidity and also to incorporate a number of substances which have been found desirable in special cases. On leaving the parchmentizing machine, the paper passes through a paper machine dryer. Here may be installed size tubs and other apparatus employed in the application of tub sizing for special papers. It is at these two points—the parchmentizing operation and at the dryers—that the basic changes in the characteristics of the paper are controlled. These steps contribute much toward making possible the 179 types of vegetable parchment available for practically every packaging need.

Vegetable parchments of normal manufacture have a considerable weight and size range. Weights range from 25 to 120 lb. per ream (500 sheets, size 24 by 36). Huge rolls, about 7 ft. wide and of endless length, can furnish sizes and shapes for almost any purpose.

Vegetable parchment may be considered as practically pure cellulose in that the action of the acid has produced substantially only a swelling action on the cellulose, leaving no reaction products such as would occur in an ordinary double decomposition chemical reaction. It has an exceedingly low ash content, in the neighborhood of 0.1 per cent. Acidity is approximately 0.01 per cent as SO_2, although many papers have approximately one-third this acidity. The pH range is 5.5–7.0 for normal papers in the ordinary base weight range. The acidity and the pH, however, as we have pointed out before, can be altered by treatment with alkali or any suitable material during the parchmentizing operation, and here we have a considerable degree of flexibility. Residual salts exist merely as traces.

Since the sheet does not contain other materials and because it is tasteless and odorless, it is particularly adapted as a wrapper coming into contact with foods.

Physical test data

As one might suppose, the physical characteristics of vegetable parchment may differ widely according to the use to which the finished product is to be put. For instance, one might parchmentize in a manner to sacrifice, let us say, Mullen, in order to bring out high tear characteristics, and vice versa. To continue along this same line, one might alter the parchmentizing in order to obtain maximum greaseproofness and with a resultant product having a lower tear and possibly a lower Mullen. Experience has shown that for normal vegetable parchment there is a balance between the physical tests of the paper compared to its greaseproofness. Wet Mullen test varies according to the type of parchment and is approximately 50–60 per cent of the dry Mullen values.

We find in the Elmendorf tear test that the sulfites range 60–80 per cent of the basis weight of the sheet, whereas the sulfates range 100–130 per cent of the basis weight of the sheet. In tensile strength, pound per inch width, the sulfites tested with the grain direction range 60–75 per cent on the above basis and across the grain direction from 30–40 per cent of the basis weight, whereas the sulfates show 90–105 per cent with the grain direction and across the grain direction 50–60 per cent. It should be pointed out here that as in the case of parchmentizing to obtain various degrees of greaseproofness of the sheet, considerable variation in the physical test may be had by altering the procedure.

We find that stretch figures will vary considerably also. For instance, with the grain direction, figures indicate 2–4 per cent and across the grain direction approximately 4–15 per cent.

Functional properties

While vegetable parchment will not disintegrate in contact with moisture or water, it has a water-vapor transmission rate in direct proportion to the treatments used in processing. When manufactured for certain uses its W.V.T.R. has been reduced to a value of 1 and lower. Here again the purpose to which the parchment is to be put must be considered, and if W.V.T.R. is not important, regular types can be used. Where the W.V.T.R. is of prime importance, special coatings can be applied to obtain almost any desired result.

One of the outstanding properties of vegetable parchment is its resistance to penetration of grease. Vegetable parchment for the packaging of greasy substances such as butter, lard, shortenings, etc., is able to withstand the penetration of greases, oils and turpentine over a very long period. The type of parchment to be used depends upon the kind of product packaged. Average tests would not be of value, for the range of performance of some 179 types of vegetable parchment naturally vary so greatly that a discussion of this subject would be lengthy.

When vegetable parchment is of a sufficiently heavy weight, it is substantially impervious to the passage of air which enhances its value for many purposes.

Vegetable parchment wets readily with water and will absorb upward of 100 per cent of its weight, but because of the very high degree of wet strength that it has due to the parchmentizing action, it will not disintegrate in contact with water. Vegetable parchment



Nonfrozen fresh fish is carefully wrapped in printed parchment which retains the moisture and flavor quality of the food.

may be boiled for many hours without losing wet strength, and this is a very important feature in the packaging of moist or wet food products. It may also be boiled in weak alkaline solutions, saturated salt solutions, without losing its wet strength.

Vegetable parchment is translucent, and on the Bausch & Lomb opacity meter will read approximately 45–60. Here again, however, we have a fairly controllable variable in that the translucency of the parchment may be altered by the degree to which it is parchmentized or by adding judicious amounts of opaque materials to the waterleaf, or by coating or sizing the parchment. The end use of the parchment would be the controlling factor.

The density or apparent specific gravity of vegetable parchment varies in the range of 0.78–0.95. The area in square feet per pound of parchment may be readily calculated by the following:

$$\text{Area in sq. ft. per lb.} = \frac{3000}{\text{basis wt.}} \text{ (500 sheets 24 by 36)}$$

Because of its inherent characteristics, vegetable parchment is a very desirable paper for use in combination with other packaging materials—for example, lamination to transparent cellulose sheets, lamination to metal foils and other materials.

Vegetable parchment varies in price according to type selected for the use to which it is to be put. It has always been in popular demand because its cost is low compared with that of other materials which give the same full packaging protection, i.e., wet strength and grease-resistance. Vegetable parchment can be beautifully printed in one to four colors with colorfast inks. The design of the wrapper is controlled purely by the imagination and ingenuity of the artist who is entrusted with the creation of the package.

End uses

Vegetable parchment provides wrapper protection where its high strength, insolubility, resistance to disintegration and greaseproofness are essential. Coupled with the virtues of being odorless and tasteless, it has for many years been the almost indispensable wrapper for butter. These same characteristics have provided necessary protection for packaging of oleomargarine, lard and vegetable shortening; for wrapping of fresh and frozen fish and poultry, fresh, smoked and processed meats; for use as bands or wrapping for vegetables and as linings of iced or un-iced shipments.

Combinations of vegetable parchment with other materials often provide characteristics necessary for satisfactory and efficient packaging. Frequently, vegetable parchment has been employed as a supporting membrane for transparent films, foil and the like. It has been laminated to transparent cellulose films for the wrapping of cream cheese. In these cases, satisfactory performance has been reported.

Laminated to itself, or to transparent cellulose films, vegetable parchment has occasionally been employed for lining the walls of fibreboard food containers. A special type is used as gasket material on fibre oil containers, and combined with glassine, it has been fabricated into C-ration packages.

Special vegetable parchments have been manufactured for use in the rubber industry as separators for unvulcanized or semivulcanized rubber, and for use on tire repair stocks, etc. Other special types of this paper have proved valuable in the manufacture of wool yarns, replacing materials which became unavailable at the outbreak of the war.

For more than 59 years, the biggest outlet for vegetable parchment has been in packaging and protecting foods. However, a few examples of the variety of applications for this material during the war will illustrate the extent of its utility: in the manufacture of gas masks, in the manufacture of methyl methacrylate, mold liners, C-ration wrappers, map tracing papers, ointment box liners, snuff box liners, special photographic purposes, liners for coffee bags, bulk shortening package liners and liners for motor oil containers. It has also been used as a dialyzing membrane.

Because vegetable parchment is both insoluble and grease resisting, it is readily used as a liner for foods packed in cans. These liners keep the contents from touching the metal and prevent discoloration, thereby adding considerably to the sales appeal.

With the advent of the cold storage locker plant, a perfected type of this material has filled another need. The modern locker plant is interested in maintaining a high quality of service and as long a preservation of food and flavor as possible.

The medical profession uses vegetable parchment for wrapping surgical instruments and dressings to be sterilized in the autoclave. It withstands scorching-hot live steam. It does not cause stain on the articles enclosed in it. Also, it can be easily marked to identify the article in the package without extra equipment.

In surgical operations sterilized vegetable parchment is used to protect tissues from injury from retractors. As a protective covering for wet dressings, it is an economical substitute for oiled silk or rubber. It is often used by nurses to make an emergency ice pack because it is strong and pliable when wet.

Future trends

The fact that vegetable parchment is grease resisting, has high wet strength and will not disintegrate even on boiling has made it a vital aid in solving many difficult problems. Used alone as a wrapper, the material meets many exacting requirements, and with the addition of special treatments and surface applications, it can do jobs never before thought possible for paper.

Almost every day new uses and applications of this versatile product are being found. Industrial applications, far afield of the normal food protection job it has done for many years, are increasing and the family group of 179 types is expected to grow.

Glassines

by E. G. Penn and C. W. Hoffman

For more than 35 years, glassine and greaseproof papers and their modifications have been used for the protection of perishable products. These papers are relatively gasproof, particularly against hydrocarbon vapors. Untreated, however, they are neither water-vaporproof nor waterproof. These qualities, particularly the latter, must be attained by a surface treatment with paraffin wax, or a mixture containing some percentage of that material. In addition, glassine has advantages wherever mechanical operation is a factor, or where transparency, heat-seal or attractive printing is desirable.

The basic qualities of glassine are derived from a combination of specially made pulp, a particular kind of manufacturing equipment and an experienced skill in processing which produces a greaseproof, flavor-retaining sheet suitable for establishing continuity of film for wax, lacquer or laminate and offering water-wapor protection with minimum cost (Table I).

The term "hydration" which so often is used in connection with glassine signifies the result of a mechanical treatment or beating of the fibre. Water is driven into the cellular structure until the fibres have become nearly gelatinous and the structure of these fibres with other cellulosic products of hydration tends to approach a continuous film of cellulose. The presence of the water in the sheet resists oil and grease penetration. After the paper is formed and dried on the paper machine, it is redampened and super calendered under tremendous pressure and heat. The paper then reaches its maximum density, having a high surface finish and great transparency; this is glassine.

If the supercalendering is omitted, the paper is not as smooth or as transparent, although the other inherent qualities are present. In this form it is known as greaseproof paper. The degree of resistance is usually measured by the number of seconds a paper can withstand penetration by turpentine. Various general properties of the papers are given in Table II.

For best strength and economy, the unbleached or lightly bleached amber types of glassine are used. There are also the opaque, pigmented whites, and the clear and colored transparent papers. Each mill has standard colors which it either stocks or runs from time to time so that smaller lots will be available. Ordinarily the massive proportions of a paper machine require that special colors and grades be made in fairly large minimum quantities for the sake of economy.

New pastel shades in glassine papers will offer something of interest to the trade for items such as fancy package liners, greeting cards and envelope liners. Metallic-coated and embossed glassine will blossom in new patterns for decorative appeal. It is anticipated that more brilliant shades will be produced with greater permanence to light and with greater resistance to mild alkalis and acids. Aniline and rotogravure printing on glassine has kept pace with the trend toward eye appeal through beautiful design, and promises to become more economical than was anticipated.

The weight of 500 sheets of glassine, 24 in. by 36 in., is taken as its basis weight. Thus 25-lb. paper means that 25 lb. of paper will cover the area of 500 sheets 24 in. by 36 in., or 432,000 sq. inches. A ream of plain glassine weighs from 20 to 40 lb.; laminated glassines may weigh from 45 to 90 lb., the appropriate weight being chosen according to the requirements of its use.

The weight of 1000 sheets in any given size which is needed for a package is calculated by the following:

$$\frac{\text{length} \times \text{width} \times \text{basis weight}}{0.432}$$

Length and width are in inches, and basis weight is in pounds. The figure obtained here, multiplied by the price of a pound, shows the cost of 1000 packages.

1—Many postwar uses will be found for packages like these triplex laminated glassine containers.



Glassine used in cartons

For food products containing oil, such as the shortening in crackers or biscuits, papers can be used in several ways. In one system, a sheet of greaseproof paper—

or, for better protection, waxed glassine—is interfolded by machinery as it sets up the carton. For further protection, a waterproof wrapping is used.

Many such packages are made by equipment which sets up the carton and the liner independently, so that the side folds of the liner are heat sealed for positive closure. After the package is filled, this type of liner may be closed by either the patented heat-seal closure or the very efficient double-fold closure developed by several machine companies. Unless the product needs unusual protection, a package of this type generally does not carry an outer wrap, for waxed glassines are the most water-vaporproof form of waxed paper. Glassine is advisable in these packages not only because it maintains the original quality of the product, but also because it allows the use of a less carefully made carton stock and printing inks which might contaminate the product through a less efficient type of liner. The glassine liner also prevents the grease of the product from staining the carton and it further helps to minimize rancidity.

The same general type has found wide acceptance in packaging cereals, brown sugar and other products where water-vaporproofness and protection of flavor and aroma are of paramount importance. The waxed liner allows reclosure of the package to protect the unused portion of the contents. Greaseproof paper and glassine are often laminated to paperboard to produce greaseproof and moistureproof carton stock.

If the product is such that contact with wax is not desirable, a liner can be made from laminated glassine. One type of machine places the liner directly from rolls of paper and closes it with glued seams. Other types insert prefabricated bags as the carton liner. These bags can be obtained with an imprint at the top, allowing for a heat-seal closure. Several soup mixtures and dessert powders are packaged in one or the other of these types. For some products, among them certain precooked cereals and dough mixtures which do not require water-vaporproofness, a plain, unwaxed glassine liner is used.

Laminated glassine

Since no single flexible packaging material is known to resist all things, it is logical to combine materials with different specific resistances by means of lamination. Thus, laminated glassine was developed some time ago to provide a basically greaseproof material with the addition of resistance to water-vapor transmission, and it is widely used in packaging today. Research on lamination has resulted in tremendous progress along these lines.

A three-ply laminated glassine offers excellent resistance to water-vapor, increased strength and more pliability than is found in other forms of the material. With the addition of wax or lacquer coatings, these combinations provide material for products needing extreme protection. Lacquered laminated glassines rank among the most highly water-vapor resistant of all packaging materials which are in general use.

Much progress has been made in the lamination of glassine to materials of a foreign structure; there are many new and practical combinations. For instance, a combination of aluminum foil and glassine produces laminations in which the specific qualities of each ply add up to a total of outstanding packaging qualities. Other combinations include glassine laminated to cellophane, acetate, board stock and many special nonglassine papers. New and versatile waxes, hot melts and emulsions now in the development stage will result in still further laminations of glassine and greaseproof papers with properties long sought to prolong shelf life of many packaged products.

Coated glassine

As mentioned previously, the smooth, nonporous surface of glassine provides a very suitable base for all types of lacquer coatings. Such coatings include organic colloids such as cellulose nitrate, resins, cyclized rubber and the like, which require organic solvents as vehicles for application. They also include coatings which melt at a sufficiently low temperature to be thermoplastically applied. All of these coatings, although expensive in themselves, can be applied to glassine in sufficiently small quantities to produce an economical packaging material. The normally good transparency of plain glassine is greatly improved by such coatings and work is being directed toward further improving the transparency of coated glassine.

In addition to heat-sealing qualities, extremely low water-vapor transmission rates are achieved. Within a short time, the return of natural rubber will make available many of the prewar coatings derived from rubber as well as many new ones developed in the laboratories during the war. Such coatings promise even greater protective qualities when applied to glassine. In combination with a stronger glassine, they will find widespread use in many of the packaging fields, especially frozen foods. Other new coatings for glassine include hot melts and brighter metallics for decorative as well as protective use.

Wet-strength glassine

One of the most recent outstanding additions to the list of valuable functional qualities of glassine and greaseproof paper is the development of wet-strength characteristics. This is the ability of the material to retain a high degree of its original strength when thoroughly wet with water. This has brought an entirely new series of glassine papers to the packaging fields. Their wet strength, combined with their greaseproofness and water-vaporproofness when waxed, coated and laminated make them suitable for the packaging of frozen foods, dairy products, meats and similar products.

In the past, various additives have been used to impart so-called wet strength to paper. However, recent



2—This bread wrap of lacquer coated glassine has the virtues of clarity and inexpensiveness.

discoveries have given to the paper industry synthetic resins with unusual properties of imparting wet-strength to glassine. One type of resin may be applied to the fibre before the formation of the sheet, attaching itself to the fibre as a colloid. Another type of resin can be either incorporated in the beater or impregnated in the sheet after it is formed but only partially dried. The resins in the subsequent drying period then polymerize to an insolubility, binding the fibres together even after long immersion and soaking with water. Such developments have provided the paper industry with a material which, in addition to giving wet-strength characteristics, will improve the general toughness of the paper under normal conditions and will not adversely affect pliability. This is important in obtaining maximum production on packaging and converting equipment.

Tests by standard tensile testing equipment show that after a 2 hr. immersion period at room temperature there is 25–40 per cent retention of original dry strength on resin-treated basic glassine or greaseproof, and approximately 50 per cent or better upon laminates.

In considering the application of the new glassine products it is well to distinguish between three similar sounding but decidedly different qualities. These are as follows:

1. *Water-vaporproofness*—This is the ability of certain barriers to resist, in varying degree according to kind and make-up, the transmission of water in its vapor phase—*no liquid water* being involved. An example is in drying out of packaged bread or tobacco.
2. *Water-resistance*—This is the ability of the material to shed water; that is, to repel water without becoming wet. Common examples are oil-skin raincoats, which, while quite waterproof, may not have appreciable ability to keep water vapor from passing through their structures.
3. *Wet strength*—This is the quality whereby certain materials retain an appreciable portion of their dry strength even when they are thoroughly soaked with water. These materials do not necessarily have either water-vaporproofness or waterproofness, although in the case of wet-strength glassine both may be added.

For example, consider the packaging of frozen vegetables such as peas or spinach in comparison with the packaging of frozen fruits-in-sirup. In the former case, the vegetables are blanched in hot water or steam to stop the enzymatic action and they are wet with small amounts of water as they are packaged to go to the freezer. While not in great quantity, the amount of water is enough to weaken standard paper and through subsequent mechanical failures to cause loss of the special protective qualities for which it is employed. The addition of wet strength obviates this hazard as well as failures caused by moisture condensation on the package due to temperature changes. Such water is not shed; it literally wets the paper but causes no harm.

In the case of the frozen fruits-in-sirup pack, a considerable quantity of water is present and the barrier must repel that water without itself becoming wet. Therefore, in addition to offering wet strength, such paper also must be waterproof. Thus wet-strength laminated glassine is not recommended, although it has a history of success as a water-vaporproof, wet-strength lining for frozen vegetable packaging. However, unless waterproofness is added with a subsequent wax or lacquer coating, it is not recommended as a waterproof lining for frozen fruits in sirup even though it may be water-vaporproof and have wet strength.

A great deal of research is being conducted in the glassine industry to improve the general strength and folding characteristics of glassine and greaseproof paper. Recent developments include an entirely new method of pulp preparation, as well as new methods for treating pulps made by the usual processes. While the resulting papers are not yet commercially available, the progress made promises stronger, more transparent glassines with better qualities throughout.

Anti-mycotic glassine

New developments are taking place involving the use of mold-inhibiting agents, which promise to find widespread use in the packaging of food products such as bread, dairy and meat products. They will also affect the packaging of soap products, textiles and many other items subject to mold or mildew. The economic loss suffered through the action of the hundreds of genera of fungi and molds upon the products of many varied industries is well known. The methods of prevention of mold and mycotic growth differ widely, depending upon the nature of the product to be protected and upon the way in which the product is manufactured and distributed. One of the most promising materials at present is compatible with cellulose nitrate lacquer, requiring only small quantities of the material, as the resulting action is dependent upon its vaporization. It, therefore, does not depend upon direct contact be-

tween the paper and the product, but tends to react throughout the package. This material, used in connection with certain packaging papers, promises to increase the shelf life of many products and to result in lower returns of rejected foodstuffs.

Special grades of glassine

Special grades of glassine are made sufficiently alkaliproof for many purposes. Waxing their surfaces enhances this quality, and lacquered glassines are excellent in this respect. Therefore, the soap manufacturer finds in glassine derivatives a wrapper which successfully combines protection with long-lasting appearance.

The inherent greaseproofness of these papers and the ability of the mills to make them without harmful acid or alkaline materials (pH range: 6.5–7.5) enabled these papers to be among the first found suitable and to continue throughout the war as excellent means for packaging highly polished machine parts whose sensitive surfaces would otherwise be corroded by more acid or alkaline material. Less grease-resistant materials also would allow escape of the oils and greases that are applied to these parts as corrosion preventives.

The density and high dielectric strength of special grades of glassine make them extremely useful for electrical insulating purposes, particularly as the interleaving in special types of electrical condensers and in coil winding.

Surgical products, such as bandages and items for first aid, are hermetically sealed in glassine and then sterilized by heating at high temperature. The dense structure of this wrapper keeps the objects sterile for a longer period of time.

Many types of machine are available for wrapping small items, particularly cakes, in waxed glassine, printed or plain. Spotting by electric eye is common, and the closures are heat sealed. The same machines handle lacquered glassines well. If printing or spotting is not desired, these machines will affix a label to this type of wrapper with a special glue. Small pies and similar products that must "breathe" are wrapped in unwaxed glassine often prefabricated into different types of attractively printed bags.

A striking example of the industry's ability to "tailor" papers for specific uses is found in the economical printed and lacquered glassines widely used for packaging bread. Specifically developed to combine strength, good mechanical operating qualities and excellent protection (flavor as well as moisture) with transparency, gloss and brilliant coloring, these papers offer an opportunity for good individual designs.

Glassine as a wrapper, a liner, a covering for carton stocks and often as an interleaf between layers, is of prime interest in packaging candy. Its greaseproof and flavor-retaining qualities preserve the package.

TABLE I—AVERAGE WATER-VAPOR TRANSMISSION RATES WAXED, COATED, LAMINATED GLASSINE (FLAT SAMPLES, GFWVT CABINET)

Grades	*Grams/100 sq. in./24 hr.*
Laminated glassine, waxy laminant	0.40–0.70
Laminated glassine, waxed both sides	0.05–0.15
Waxed glassine, single-ply waxed both sides	0.10–0.30
Lacquered glassine, adhesive seal, both sides coated	0.15–0.25*
Lacquered glassine, heat seal, both sides coated	0.10–0.40*
Lacquered, laminated glassine, both sides coated	0.10–0.15*

* Depending upon type of lacquer.

TABLE II—PROPERTIES OF GLASSINE AND GREASEPROOF PAPERS

	Greaseproof papers	*Glassine papers*	*Waxed glassine*	*Laminated glassine*	*Lacquered glassine*
GENERAL PROTECTIVE FUNCTIONS					
GREASEPROOFNESS	Yes	Yes	Yes	Yes	Yes
FLAVOR RETENTION	Yes	Yes	Yes	Yes	Yes
WET STRENGTH	Available	Available	Available	Available	Available
RESISTANCE TO GAS TRANSMISSION*	Fair	Fair	Good	Good	Good
WATER-VAPORPROOFNESS	No	No	Yes	Yes	Yes
GENERAL PACKAGE FORMING QUALITIES					
PLIABILITY, SOFTNESS	Yes, in plasticized grades	Yes, in plasticized grades	Yes, in plasticized grades	Excellent	Yes, in plasticized grades
GLUE SEAL	Required	Required	Can be used	Required	Can be used
HEAT SEAL	No	No	Yes, but of limited strength	No	Yes, very positive
GENERAL ADAPTABILITY TO VISUAL FUNCTIONS					
TRANSPARENCY	No	Satisfactory	Good	Fair	Good
SMOOTH SURFACE	No	Yes	Yes	Yes	Yes
HIGH GLOSS SURFACE	No	No	Yes, but will smudge	No	Yes
GLOSS PRINTING AVAILABLE	No, but prints well	Yes	Yes	Yes	Yes
COLORS, TRANSPARENT	No	Yes	Yes	Yes	Yes
COLORS, OPAQUE	Yes	Yes	Yes	Yes	Yes

* See L. W. Elder, "Permeability of Flexible Materials," MODERN PACKAGING, XVI, No. 11 (July, 1943), p. 69.

Wet-strength papers

A paper which retains its toughness after being saturated with water is said to possess the property of wet strength. This property is extremely important today in papers used in a wide variety of packaging techniques for certain kinds of foods and for extenuating conditions of storage or shipping. Successful paper wrapping of meat and vegetables, for example, cannot be achieved with paper which loses its strength on being wet. If paper is used to protect foods which are to be kept in cold storage plants, wet strength is highly important in the wrapper. For meats in particular, wet-strength paper offers advantages. The product may be thawed and the wrapper stripped in one piece without sticking to the contents. In home units the packages may be thawed, unwrapped, the contents partially used and rewrapped for further storage. Extreme examples of wet strength are the papers used to wrap surgical instruments which are sterilized with live steam.

In the past, several materials and processes have been used to impart the property of wet strength to paper: glue-formaldehyde, regenerated cellulose (viscose), urea-formaldehyde, zinc chloride and parchmentization. All of these treatments require special equipment in the paper mill. During recent years, melamine-formaldehyde has been used with great success. This development is of particular interest to users of packaging supplies when specifying papers where a high degree of wet strength is essential.

1—Wet-strength treatment with urea-formaldehyde resin adds new qualities to the kraft grocery bag.

PHOTO, COURTESY RESINOUS PRODUCTS AND CHEMICAL CO.



Melamine processes[1]

Beater sizing—Melamine compounds for paper treatment are received at the paper mill in finely divided form. This product needs only to be dissolved in warm water containing hydrochloric acid and then allowed to stand for a few hours before using. During this aging period, the colloid is formed. In the beater process it is this colloid which attaches itself to the paper fibres. Although termed "beater sizing," this treatment actually includes the addition of resin to stock at any point from the beating of the fibres to the time the paper sheet is formed. The most satisfactory point of application for the melamine-formaldehyde resin solution is often found to be after all the beating and other refining have been completed and as close to the paper machine wire as operating conditions permit.

Melamine-formaldehyde resin has a particular characteristic which some other materials, previously used for beater sizing, do not have. The melamine resin is largely retained by the paper fibres so that it is not lost in the water of the paper-making process. Because of this fact, it can be added to the paper pulp before the sheet is formed. No modification of either machine or operation in the paper mill is required.

It has been found that the melamine beater treatment imparts a wet strength which resists prolonged storage conditions of high humidity and heat better than does wet strength from urea-formaldehyde tub sizing. Effects of tub treatment versus beater treatment on folding and tearing strength properties of paper are shown in Table I. It will be noted that for comparable wet tensile strength the beater treatment offers an increase in fold strength and a relatively small drop in tear strength.

The following test results show how melamine treatment of paper pulp imparts extraordinary wet strength to the sheet to which it has been added and at the same time greatly increases folding resistance of the dry sheet.

Cellulose fibres treated with not in excess of 3 per cent of the melamine resin colloid retained 70–90 per cent of the added resin. The wet strength, as measured by wet tensile strength after soaking 16 hr., increased from almost nothing to 50–60 per cent of the original dry strength. Wet Mullen increased in about the same proportion, while the wet rub resistance (double strokes to wear through the paper) rose from an average of 10 to several thousand. This latter property should be of

[1] See "Use of Melamine Resins for Better Wet Strength," by Charles S. Maxwell, Paper Trade Journal, *116*, 39 (May 13, 1943).

TABLE I—OVEN-AGING TESTS*—105° C.

Type of resin	Applied at	Wet tensile,† hours aged			Fold-MIT hours aged			Tear-Elmendorf-g., hours aged		
		0	16	72	0	16	72	0	16	72
UNTREATED KRAFT		0.5	1.4	1.9	223	219	152	84	79	75
UREA-FORMALDEHYDE	Tub	10.3	10.8	11.2	189	120	40	45	47	34
MELAMINE-FORMALDEHYDE	Tub	4.6	11.9	11.4	191	89	41	64	48	38
MELAMINE-FORMALDEHYDE + HCL	Beater	8.1	9.3	9.0	1035	834	461	69	72	54

* All tests made on bleached kraft handsheets with approximate basis weight of 50 lb. (25 in. × 40 in.—500).
† Wet tensile measured in machine direction on strips soaked 16 hours. Results expressed as pounds per inch.

interest in connection with the treatment of containers for such products as kitchen cleaning powders.

Dry Mullen and dry tensile values were increased about 15 per cent. The folding endurance, instead of dropping, as in the case when wet strength is obtained by tub treatment, was materially increased.

Aging properties of paper stock treated with melamine resins were shown by the following results. Under accelerated oven aging conditions of 72 hr. at 105° C. (aging test used by U. S. Bureau of Standards), the folding endurance of the melamine-treated paper so aged was higher than that of the original untreated paper and was much higher than the tub-treated.

Tearing strength is lowered by all wet-strength treatments. However, paper which has been sized by the melamine beater treatment shows less lowering of tear values than does the tub-treated paper.

As far as is known, any of the usual paper-making sizing materials and fillers may be used with the melamine treatment without deleterious effects. Experiments in which various types of dyes were incorporated with the melamine-treated stock showed changes in shade, strength and fastness properties of some dyes. In certain instances fastness to bleeding in hot or cold water was definitely improved. In other instances, decreased fastness to light was observed.

By considerable laboratory research and mill trials, it has been concluded that the melamine treatment is effective on any form of cellulose fibre, although results are more noticeable when used with a strong pulp. A wet-strength kraft sheet may have a dry tensile strength of 20 lb. and a wet tensile of about 10 pounds. Groundwood sheet given similar treatment showed dry tensile of 2 lb., wet tensile of 1 pound.

Tub sizing—In certain cases treatment of paper sheet by the tub-sizing process is satisfactory. For example, it is sometimes desirable to heat paper for wet strength during various converting operations. The same melamine-formaldehyde compound can be used in this treatment as is used in the melamine beater sizing. Hydrochloric acid, however, is not used in tub sizing. It is necessary to incorporate special equipment for the treatment.

Other processes

The following data about other processes used to impart wet strength to papers will help the user to make comparisons of relative qualities:

Glue-formaldehyde—The glue-formaldehyde process leaves an unpleasant odor which makes it unsuitable for papers to be used in direct contact with foods. The process requires special equipment and the necessary ingredients are costly.

Regenerated cellulose—This is expensive and requires very special equipment which is not suited to paper mill operation, although the resulting product can be made with wet strength, durability and grease-proofness.

Urea-formaldehyde—This treatment can impart excellent wet strength both to rosin-sized and waterleaf paper when the paper web is impregnated with the resin solution and the resin subsequently cured on the paper-machine driers.

Certain modified urea-formaldehyde resins, however, have been successfully employed in beater application.

Parchmentization—This treatment requires special equipment and is expensive but imparts high wet-strength and greaseproof properties.

TABLE II—EFFECT OF ADDING RESINS* BEFORE OR AFTER REFINING†

Length of beater treatment (full load), min.	Length of Morden refining, min.	No resin added		Resin added§ before Morden			Resin added‡ after Morden		
		fold, MIT	wet tensile‡	resin, %	fold, MIT	wet tensile†	resin, %	fold, MIT	wet tensile†
0	0	2	1.0	1.5	24	2.7	1.4	18	2.9
15	0	28	2.0	1.7	264	5.1	1.5	522	7.0
15	2	114	2.4	2.2	1074	7.8	2.0	1148	10.2
15	5	576	2.9	2.4	1177	7.6	2.1	1141	11.7
15	15	1537	2.7	2.4	1517	6.6	2.3	2160	15.8
15	30	1762	2.5	2.3	3181	5.3	2.4	3233	14.4

* Melamine-formaldehyde resin plus hydrochloric acid.
† All tests made on bleached kraft handsheets with approximate basis weight of 50 lb. (25 in. × 40 in.—500).
‡ Wet tensile measured in machine direction on strips soaked 16 hours. Results expressed as pounds per inch.
§ 3% Resin (on dry fibre basis) added in each instance.

Metal foils, technical aspects

Metal foil and metal foil laminations, because of their decorative and functional properties, are in demand today for packaging a great many products. Foil combinations can be made to have extraordinary protective qualities. As the result of improvements in multicolor printing, laminations with plastic films, use of heat-sealing coatings and other innovations, foil-based structures may be fabricated into a wide variety of package forms with excellent protective and merchandising properties.

Although a limited quantity of other metals are used for special purposes, the majority of metal foils today are made from aluminum. In some cases the metal foils are used alone. Generally, however, it is necessary to laminate or coat the base metal with varying amounts of different materials in order to obtain all the desired physical and functional properties.

According to Webster's dictionary, foil is a "leaf" or very thin sheet of metal. From the manufacturer's viewpoint, foil is metal rolled to gauge ranging from 0.005 in. to about 0.0002 inches. Metal foil may be prepared from a commercially pure metal or from an alloy.

The metals commonly used in the production of foils are tin, lead, zinc and aluminum. Of these, tin and lead are the oldest in point of service. Zinc is used as foil in very limited amounts. Copper is available in foil thicknesses but its uses in this class are restricted to highly specialized applications. The precious metals may be rolled to foil but, for obvious reasons, they are not considered commercially useful.

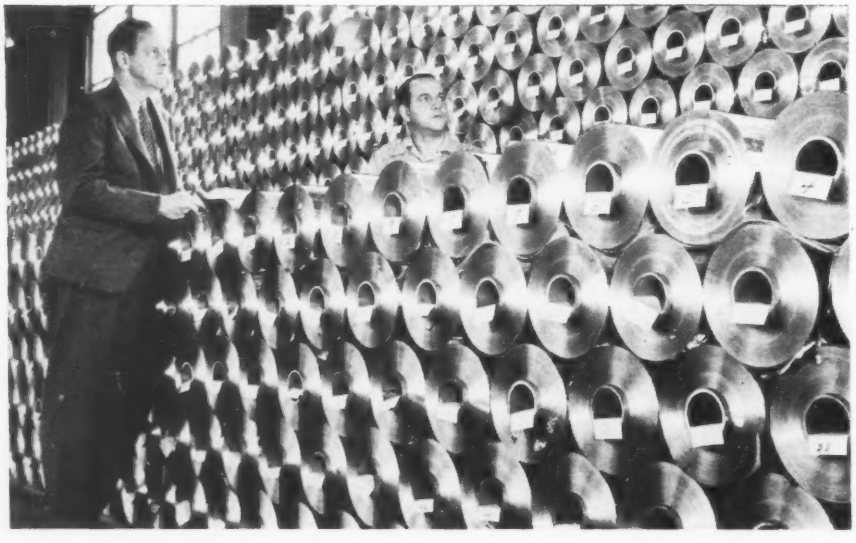
Aluminum has been available in the form of foil for more than 30 years and has reached a leading position as a result both of its inherent properties and of technical developments in the field.

The methods followed in producing foils of various metals have certain similarities: the breakdown of the cast ingots through the slab stage into coiled sheet strips and finally into coils of foil. Transition of the cast ingot into foil is made by repeatedly passing the metal through rolls adjusted to width, diameter, weight, shape, temperature, pressure and speeds.

Basic changes in procedure are made when necessary to meet specific differences in the metal or alloy being rolled. For instance, aluminum is hardened by the mechanical working resulting from cold rolling. Its tensile and yield strength are higher in this strain-hardened condition and its elongation is lower. This characteristic of aluminum requires that the metal be softened by annealing at intervals during the rolling process. No annealing is necessary in the rolling of lead, tin and zinc. A final anneal after the desired gauge is reached is normally used for aluminum in order to supply the metal in the soft or annealed condition. The annealing operation also frees the metal from the small quantity of lubricant not squeezed off by the rolls.

The annealing conditions in commercial practice will vary, depending upon the thickness of the metal, its width and its coil diameter. As a rule the metal temperature reached will be higher than 550 deg. F. The time of heating is determined from experience and may vary from a matter of minutes to hours, depending on conditions. The high temperatures necessary for the final annealing of aluminum foil produce a clean and sterile foil which is immediately suitable for many packaging duties.

PHOTO, COURTESY ALUMINUM CO. OF AMERICA



1—These silvery rolls represent a quarter of a million pounds of aluminum foil, intended for the packaging of vital military machinery—but they are now to be converted into wrapping materials for a number of peacetime products.



2—Here are illustrated several uses for metal foil: tea carton is foil laminated to paper; protective overwrap for candy package of laminated foil and paper is used with printed side out; prune box has a printed foil tight wrap; tablet pack shows war development of face-to-face sealed packet of foil-kraft-cellophane combination; foil combinations will be used widely for small unit packages, shown for coffee and drugs.

PHOTOS 2, 3 AND 5, COURTESY REYNOLDS METALS CO

Zinc can be rolled to foil thicknesses with equipment suitable for producing aluminum foil. Lead and tin foils are best rolled on differently shaped rolls, with different roll lubricants, and wound on reels instead of spools.

Neither lead, tin nor zinc requires annealing of the finished foil to obtain softness, because this condition is attained automatically at room or rolling temperatures. The procedures for all four metals are alike in that they are all cold rolled. The percentage reduction in thickness per pass varies, depending on the individual characteristics of the metal and also, to some extent, on the type of mills used and the practices preferred by the various foil-rolling companies.

Metal foils may be produced on 2-, 3- or 4-high mills (the numbers representing the number of rolls, one above another) built especially for this operation. Tandem mills, where two or more mills are operated as a unit, may be fitted for use on coiled sheet and foil operations.

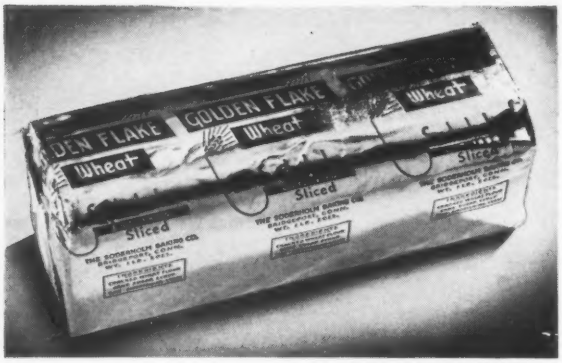
Cluster type mills, where rolls are arranged in one mill stand to permit applying a series of reducing passes on the metal, also are used in foil rolling.

Metal foils differ among themselves in physical and chemical characteristics and these differences, along with economic considerations, must always be examined carefully when choosing the foil to meet specific packaging requirements. The chemical characteristics of the foil metals are generally known, but when deciding the suitability for a given application, it is desirable to confirm the tentative selection by means of practical packaging and storage tests.

The fact that aluminum is nontoxic is well known because of the background of experience with the metal in cooking utensils and its many successful applications in the food industries. Similarly, tin in the form of tin plate has set a standard in the canning industry. In many cases the packaging usefulness of these and other foils can be extended by means of protective coatings which will serve as barriers



3—New developments in foil suggest many new uses for the future. Laminated aluminum foil and vinyl film for a bandage wrap withstand sterilization process; dehydrated tomato mix is packaged in heat-sealed foil envelopes; scissors and razor blade packages show use of foil for preservation packaging; yeast wrap is made from rotogravure printed foil in roll form, automatically packaged with electric-eye cut-off registration.



PHOTO, COURTESY MILDRED C. LUCAS

4—One designer says bread wrapper of the future is aluminum foil; "breathing" tests were made.



5—These aluminum foil envelopes hold cleaning powder; when empty, they act as catalyst in solution.

against reaction between the packaged goods and the metal. A knowledge of the product to be packed, its expected durable life and the conditions of storage, when considered along with information of chemical reactions possible with the metal foils, will enable a selection to be made in many cases.

Frequently one of the most important characteristics of a packaging material is the resistance it offers to penetration by moisture or other gases. Metal foils are outstanding in this respect since, when free from pinholes or other defects, they are completely impervious. Metal foils can be produced in thicknesses of 0.001 in. or more, relatively free from pinholes, although in the thinnest gauges some pinholes are unavoidable. When the foil is coated or laminated with plastic materials, pinholes can be sealed. Lamination with plastics may add other desirable characteristics, such, for example, as the increased resistance to tearing which results from creasing and handling.

The specific gravity or density of foil is usually associated with the covering area per unit of weight. This is a significant factor to consider for wrappers or packages. Some typical figures are given in Table I.

The values for tensile strength (p.s.i.) or percentage elongation obtained from mechanical property tests on metal foils change with variations in thickness of the sample tested. Because of these variations the mechanical properties (yield strength, elongation, bursting strength and tearing strength) are not in themselves sufficient for evaluating the usefulness of metal foils as materials for packaging.

It should be emphasized that the mechanical characteristics of metal foils can be modified by means of suitable coatings either in the form of lacquer, paper or plastics. Thus, through the use of foil in combination with suitable supporting mediums, a product may be obtained which often approaches the ideal.

6—Dated packets of garden inoculation are effected with laminated foil and acetate film, heat sealed.

PHOTO, COURTESY THE DOBECKMUN CO.



TABLE I—SOME TYPICAL PROPERTIES OF METAL FOILS

Metal	*Description*	*Density, grams/cc.*	*Thickness, in.*	*Covering area, sq. in./lb.*
ALUMINUM	Commercially pure	2.7	0.0010	10,250
LEAD	Commercially pure	11.3	0.0010	2,450
TIN	Commercially pure	7.3	0.0010	3,750
ZINC	Commercially pure	7.2	0.0010	3,980
LEAD COMPOSITION	Lead alloy with 4% tin	...	0.0010	2,500
LEAD COMPOSITION	Lead alloy with 10% tin	...	0.0010	2,550

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,250

,450

,750

,980

2,500

2,550

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PROPERTIES

The values in this chart were obtained from various sources and are belie

Manufacture

PROPERTIES	METAL FOILS			
	Aluminum Foil	Tin Foil	Lead Foil	
GENERAL				
Forms Available	Rolls & Sheets	Rolls & Sheets	Rolls & Sheets	
Clarity	Opaque	Opaque	Opaque	
Thickness Range, in.	0.0003–0.005	0.0006–0.002	0.0006–0.002	
Maximum Width, in.	45	26½	26½	
Area Factor, sq. in. per lb.	10,250 for 0.001 29,200 for 0.00035	3,750 for 0.001 gauge	2,400 for 0.001 gauge	2,3
Specific Gravity, approx.	2.7	7.3	11.3	
MECHANICAL				
Tensile Strength, lb./in. TAPPI # T-404M	2–135	—	—	
Elongation % TAPPI # T-457M	0.4–20	—	—	
Bursting Strength (Mullen), lb./sq. in.	2–175	—	—	
Tearing Strength (Elmendorf), grams	6–480	—	—	
Seal Strength (Suter), lb./in.	—	—	—	
Folding Endurance (M. I. T.)	4–18	—	—	
CHEMICAL				
Water Absorption in 24 hr. Immersion Test, %	Zero	Zero	Zero	
Permeability to Gases	Negligible	Negligible	Negligible	
Water-Vapor Permeability (Southwick-Rhoades), grams/24 hr./-100 sq. in.	Negligible	Negligible	Negligible	
Resistance to Acids	Poor to good	Poor to good	Poor to good	
Resistance to Alkalis	Poor to good	Poor to good	Good	
Resistance to Greases & Oils	Excellent	Excellent	Excellent	
Resistance to Organic Solvents	Excellent	Excellent	Excellent	
PERMANENCE				
Resistance to Heat, °F. (Limiting Temp.)	700°	300°	500°	
Resistance to Cold, °F. (Limiting Temp.)	−120°	—	—	
Resistance to Sunlight	Excellent	Excellent	Excellent	
Dimensional Change at High R.H. %	None	None	None	
Resistance to Storage	Unaffected	Unaffected	Unaffected	
Flammability	Not combustible ordinarily	Not combustible	Not combustible	
Suppliers	Aluminum Co. of America Johnson Tin Foil & Metal Co. Reynolds Metals Co.	Johnson Tin Foil & Metal Co. Reynolds Metals Co.		

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TIES OF METAL FOILS AND FOIL LAMINATIO

d are believed to represent acceptable commercial standards. Special grades of some of these materials may be obtai
anufacturers should be consulted for additional special information or for new uses of their materials.

		SPECIALIZED F			
	Tin and Lead Composition Foil (4% Tin)	Fabricated Containers 0.004 Al. Foil	Heat Sealing Material: Al. foil—Special adhesive—Paper—Special adhesive—Al. foil—Heat seal coating	Heat Sealing Material: Al. foil—Water resistant adhesive—Paper—Microcrystalline wax—Porous tissue	Heat Sealin Cellulose Thermopl sive—Al. seal c
s	Rolls & Sheets	Rolls	Rolls—Sheets—Bags	Rolls—Sheets—Bags	Rolls—F
	Opaque	Opaque	Opaque	Opaque	Opa
	0.0006–0.002	0.004	0.003	0.0044	0.0
	26½	—	—	—	-
auge	2,500 for 0.001 gauge	2,540	5,500	6,500	5,0
	11.1	2.7	—	—	-
	—	40	29	19	2
	—	12.7 – 13.5	2.7	2.9	2
	—	110 – 115	39	19	5
	—	230 – 260	60	15	4
	—	—	3	1	1
	—	15 – 17	154 @ 1 Kg.	55 @ 1 Kg.	240 @
	Zero	Zero	—	—	-
	Negligible	Zero	Negligible	Negligible	Negl
	Negligible	Zero	Negligible	Negligible	Negl
d	Poor to good	Poor to good	Poor to good	Poor to good	Poor t
	Poor to good	Poor to Good	Poor to good	Poor to good	Poor t
	Excellent	Excellent	Excellent	Poor	Po
	Excellent	Excellent	Attacked by aromatic & active solvents	Poor	Attacked & active
	450°	700°	120°	120°	12
	—	−120°	Good to −40°	Good to −40°	Good t
	Excellent	Excellent	Excellent	Excellent	Go
	None	None	None	None	No
	Unaffected	Unaffected	—	—	-
ble	Not combustible	Not combustible ordinarily	—	—	-
	letal Co. Co.	Reynolds Metals Co.			Dobeck Milpri Shellmar F Reynolds

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METAL FOILS AND FOIL LAMINATIONS

resent acceptable commercial standards. Special grades of some of these materials may be obtained w

be consulted for additional special information or for new uses of their materials.

	SPECIALIZED FOIL
Lead on Foil in)	Fabricated Containers 0.004 Al. Foil	Heat Sealing Material: Al. foil—Special adhesive—Paper—Special adhesive—Al. foil—Heat seal coating	Heat Sealing Material: Al. foil—Water resistant adhesive—Paper—Microcrystalline wax—Porous tissue	Heat Sealing Ma Cellulose aceta Thermoplastic sive—Al. foil— seal coatin
heets	Rolls	Rolls—Sheets—Bags	Rolls—Sheets—Bags	Rolls—Envelo
ue	Opaque	Opaque	Opaque	Opaque
.002	0.004	0.003	0.0044	0.0025
	—	—	—	—
1 gauge	2,540	5,500	6,500	5,900
	2.7	—	—	—
	40	29	19	21
	12.7 – 13.5	2.7	2.9	2.4
	110 – 115	39	19	50
	230 – 260	60	15	40
	—	3	1	2
	15 – 17	154 @ 1 Kg.	55 @ 1 Kg.	240 @ 1 Kg
	Zero	—	—	—
ble	Zero	Negligible	Negligible	Negligible
ble	Zero	Negligible	Negligible	Negligible
ood	Poor to good	Poor to good	Poor to good	Poor to goo
ood	Poor to Good	Poor to good	Poor to good	Poor to goo
nt	Excellent	Excellent	Poor	Poor
nt	Excellent	Attacked by aromatic & active solvents	Poor	Attacked by ar & active solve
	700°	120°	120°	120°
	−120°	Good to −40°	Good to −40°	Good to −4
nt	Excellent	Excellent	Excellent	Good
	None	None	None	None
ted	Unaffected	—	—	—
stible	Not combustible ordinarily	—	—	—
	Reynolds Metals Co.			Dobeckmun Milprint, In Shellmar Produ Reynolds Meta

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IONS

obtained which excel in some particular property.

ED FOIL PRODUCTS

Sealing Material: ulose acetate—moplastic adhe—Al. foil—Heat seal coating	Heat Sealing Material: Al. foil—Heat seal coating	Tight Wraps: Al. foil —Water resistant adhesive—Paper	Butter and Cheese Wraps: Protective lacquer coating—Al. foil—Protective lacquer coating—Microcrystalline wax—Special parchment
lls—Envelopes	Rolls & Envelopes	Rolls & Sheets	Rolls & Sheets
Opaque	Opaque	Opaque	Opaque
0.0025	0.0022	0.0029	0.0037
—	—	—	—
5,900	5,000	9,200	9,400
—	—	—	—
21	19	15	14
2.4	6.5	1.7	3.2
50	45	19	14
40	100	50	32
2	6	—	—
240 @ 1 Kg.	18 @ 0.5 Kg.	10 @ 1 Kg.	390 @ 1 Kg.
—	—	—	—
Negligible	Zero	Negligible	Negligible
Negligible	Zero	Negligible	Negligible
Poor to good	Poor to good	Poor to good	Good
Poor to good	Poor to good	Poor to good	Good
Poor	Excellent	Good	Excellent
ked by aromatic active solvents	Attacked by aromatic & active solvents	Good	Poor
120°	120°	300°	120°
Good to −40°	Good to −40°	—	Good to −40°
Good	Excellent	Excellent	Excellent
None	None	None	None
—	—	—	—
—	—	—	—
obeckmun Co. Milprint, Inc. mar Products Co. nolds Metals Co.	Reynolds Metals Co.		

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Printed transparent sheeting

When transparent sheetings were first introduced as packaging materials, their very novelty was sufficient to assure sales appeal for the products they wrapped. As costs were reduced and wider application of these materials was made, more was learned about their sales-stimulating power. However, when two or more similar products were competing in the same outlets in transparent packages, the need for distinctive appearance and an effective sales story became apparent. The importance of printing on these materials was thus recognized, and gave impetus to the development of transparent sheetings as packaging materials in competition with other wrappings.

In industry after industry, this cycle was repeated—the use of sheet wraps or bags was followed by beautifully printed wraps or bags. Even on mass market, in the case of cheap, daily purchase items like bread, a growing trend was apparent toward the use of printed transparent wrappers—this in spite of higher costs than those involved with an unprinted wrap and a printed, waxed paper band label. The printing in this case increased display value in the store, made the loaf recognizable, even if only one end was visible on the bread display rack, and offered an ample opportunity to feature the brand name and dietetic advantages on each and every wrapper. Generally, its use was restricted to specialty loaves made of ingredients which commanded a higher market price than the standard white bread. The printed wrapper set the loaf out from its cheap competition, even though the bread itself did not actually look any different from the various other brands.

Cranberries packed in printed transparent bags commanded a higher market and retail price, more than absorbing increased packing costs. The package protected the berries, giving them a longer display life, permitting convenient display throughout the grocery store and carrying the brand name into the home. The printed transparent bag converted a bulk, unbranded food into a fast selling, profitable specialty. Similar marketing revolutions have been put over with fresh tomatoes in open top folding boxes machine-wrapped in imprinted roll film and with dried beans, packed in printed transparent bags and shipped over wide areas; both carrying the packer's trade-mark into the home and assuring the housewife of uniform high quality and sanitation.

The possibility of creating and reproducing highly artistic colorful designs on transparent films should not blind us to the prosaic but highly successful performance of simple one- or two-color printing jobs on these materials. As new films become available, we can predict the rapid development of new and different printed applications.

In creating designs for transparent packages, the product itself becomes the background. This and other problems suggest the advisability of checking the design problem with the film converter early in the game. His design staff may suggest effective ideas which will improve sales appeal without imposing additional manufacturing problems. For example, "hit or miss" designs may be as effective as registered designs in a particular application, and they may reduce costs and the need for electric-eye control on wrapping machines.

PHOTOS 1, 2, 3 AND 5, COURTESY THE DOBECKMUN CO.



1—Transparent wraps help to retain the flavor of dried fruits. The wrap assures visibility of the contents, and the printing affords an opportunity for brand identification.



2—Transparent sheeting is an effective background for gaily printed Christmas designs, and has attained well-deserved popularity for seasonal gift usage.

In the order of their development, there are three major processes of printing on transparent sheeting. These are:

1. Letterpress, which employs relief engravings and oil inks.
2. Gravure, in which impressions are made from etched cylinders with lacquer inks.
3. Aniline, using spirit inks and, usually, rubber printing plates.

Which of these processes would be most satisfactory for the case at hand depends upon:

1. The art work—Most designs can be printed in any one of the three processes with striking results. However, art work involving fine halftone screen, soft-tone work or color should be printed in gravure.
2. The nature of product—Certain products contain chemicals either inherent or added by processing which may attack the inks. For example, oil of wintergreen used in confections, such as mints, attacks certain aniline ink colors, whereas letterpress or gravure inks remain fast and, in the main, inert. Packages for fruits processed with sulfur dioxide often employ the use of a protective metallic ink as a base for other colors.
3. The type of film used—While the type of film does not limit printing to any one of the three processes, the nature of the product and its handling in production and in the finished package form should be carefully considered when the film and the type of printing are selected.

3—The art of the color printer is used to equal advantage on wraps for paper cartons and metal cans.



Letterpress printing

This is the best known of all printing methods and is the one by which the first successful printing on transparent cellulose was accomplished. However, due to the temperamental nature of the film, really successful commercial production was not attained until roll-fed presses were employed. These required the addition of many devices, such as means of continuous control of the web or sheet during the printing operation to ensure registered printing of successive colors. Several types of roll-fed presses are presently in use. In some types, a number of printing or plate cylinders are arranged around a central platen cylinder and the printing is done on a continuous web, which is then delivered in the form of either sheets or rolls. Other types of press cut the sheet to a predetermined size before the printing impression is made.

Letterpress printing may be done on either surface of the cellulose film and, where it is not objectionable for the printed side to come in contact with the product

to be packaged, the use of reverse or underside printing permits the retention of the full gloss, or sheen, of the cellulose, thus enhancing and vivifying the colors of the inks. Letterpress printing is also employed almost exclusively where the printed cellulose is to be used on moist or greasy objects, as, for example, on a variety of meat or fish products.

Gravure printing

This process came into use only after letterpress printing on transparent cellulose had become fairly well standardized and its limitations had been explored. The inks used are of the fast drying, lacquer type, which not only eliminate the use of slip-sheets, but permit the printer to obtain a degree of opacity impossible with oil inks, as well as to print color upon color in a continuous operation. The pigments used in gravure inks permit, also, the obtaining of very brilliant full colors and shades.

Since gravure printing can only be accomplished through the use of intaglio-etched cylinders, the cost of engravings for this process is relatively higher than for either letterpress or aniline printing. The combination of more than one design on a set of cylinders is impossible, unless all of the designs can be executed within the limit of the number of colors available on the press, and unless each design, in repeat runs, can be produced at the same time and in the same quantity proportion as the original run. At present, presses are available where as many as seven colors may be produced at a single run.

The gravure method produces the highest type of printing available at present on transparent cellulose, and particularly attractive effects are obtained through the use of reverse printing. Half tones can be satisfactorily reproduced, provided the tone work can be underlaid with a neutral color, such as white. Gravure printing is not recommended for use where the product to be packaged is of a greasy nature or where the item has a high moisture content.

Aniline printing

This type of printing is among the most recent to be used for transparent cellulose. Because it generally employs rubber, rather than metal printing plates, and because it employs fast drying inks, eliminating the necessity for slip-sheeting, it was originally hailed as a means of producing printed cellulose more economically than the older processes. However, the limitations of the process and inks originally employed made aniline printing less satisfactory from the standpoint of package appearance and users of printed cellulose were reluctant to adopt it, even at somewhat lower costs. Since aniline printing was originally introduced, much progress has been made in improving results and some highly creditable work has already been accomplished by this process. Naturally, this has involved the use of more expensive materials and



PHOTOS 1 AND 2, COURTESY MI-PRINT INC.

4—For restaurant and drugstore use, this coffee is dispensed in individual, imprinted cellophane bags.

equipment. The cost of aniline printing today is probably at approximately the same rate as the cost of letterpress.

Tone work in aniline printing is possible only to a very limited extent and its use on moist or greasy products, particularly foods, is somewhat questionable. It does give excellent opacity, brilliant colors and, particularly in surface printing, a luster which is superior to that of either letterpress or gravure.

The development of methods of printing transparent film in continuous rolls has contributed largely to the expanded use of such wrappers in mechanical packaging. Starting with the wrapping of bread, this application has spread into many fields. Controlled cut-offs, made possible by the use of photoelectric cells, permit

5—Label panel, applied to transparent bag by aniline printing method, is easily marked by retailer.



"spot" wrapping the printed film on cartons or open-faced trays, in addition to permitting the use of printed transparent rolls on automatic machines.

General information

Tints—Both gravure and aniline inks may be used in producing tints on transparent cellulose. A wide range of colors is available and the tints do not impair the gloss of the film. They alter its transparency only as the color of the tint reacts on the color of the product packaged. Letterpress tints generally are not very satisfactory.

Opacity—As mentioned in preceding paragraphs, gravure and pigmented aniline inks produce impressions of greater opacity than letterpress, although the latter gives a degree of opacity suitable for its use for a great many purposes.

Metallics—The gravure process is pre-eminent for printing metallics. Brilliance or opacity can be obtained with a single impression, although two layers of color may be employed where extreme opacity is desired. Letterpress metallics are very satisfactory in surface printing, where the metallic may be underlaid with a sizing, as of yellow in the case of gold, or white in the case of silver. Where reverse printing is employed, letterpress metallics cannot be underlaid and are correspondingly lacking in opacity. Satisfactory metallics for aniline production have not as yet been developed.

Reverse printing—All three printing processes may be employed to produce reverse printing, although letterpress is inferior to either gravure or aniline for this purpose, except where solid lays of full color are sometimes used.

Register—Where fine register is required, the letterpress process is superior to either of the others. The use of metallic plates, giving sharp, controllable register permits the production of effects not possible with either gravure or aniline. Where the design is such that color may be superimposed on color, register often is of negligible account in gravure or aniline work.

Tone or screen work—Ben Days and half tones are well within the range of most good producers of letterpress printing on transparent cellulose. Half tone work is possible to a considerable degree in gravure, with a range of Ben Day screens or stipple effects also available.

With the amount and character of the research now going forward in the field of cellulose printing, it is not too much to expect that four-color process work will eventually be done on this material.

6—This printed cellophane overwrap combines eye-catching band design with lively all-over pattern.



Package forms

Printed transparent cellulose is available in a variety of forms, the better known of which are listed below:

Sheets—These are available in any type of film, printed in from one to seven colors, in practically any desired size.

Rolls—Continuous printed rolls of any type of film are obtainable in widths ranging from $^1/_4$ in. to 36 in., printed in as many as seven colors. Printed designs may be continuous or may be spot-registered for use on automatic packaging machines, where the printed design is accurately located on the package by means of a photoelectric cell device.

Bags—Single- or double-wall bags of transparent cellulose, printed in seven colors or less, are available in flat, square and satchel bottom styles. Nearly all types of film may be employed in their construction. Sizes range from very small bags, in the flat type, up to 10 in. by 18 in. in the satchel bottom style.

Envelopes—Both die-cut and roll-cut styles are available in a wide range of sizes with either side or end openings and with printing in any number of colors up to seven. Most types of transparent cellulose can now be successfully fabricated into envelopes.

Specialty packages—Tubes for cigars and other slender objects, such as toothbrushes, are available, printed in as many as seven colors and in most types of film. Other packages, combining printed cellulose faces with backs or affixed pieces of board or other material, may also be obtained. Sheets or rolls of printed cellulose, affixed at one or both sides to corresponding sheets or rolls of foil, glassine and other materials, are available. Other types of packages employ sheets or rolls of printed cellulose in combination with folding cartons or with fibre plates or trays; in some instances, such combination packages are supplied with retaining rings or other parts to make a complete package.

Laminated printed cellulose—For the purpose of this article, it may be said that printed cellulose, laminated to a variety of base materials, is available in sheets, rolls, specific types of bags and folding cartons.

Window-faced wraps—These have been developed essentially as a means of combining the advantages of opaque and transparent materials for wrapping purposes. They are formed by pasting together continuous alternate strips of paper and transparent film. In most instances, moistureproof cellulose and greaseproof glassines are combined and widely used particularly in the baking industry.

Laminated structures

by C. A. Southwick, Jr.

Lamination is the process of combining two or more plies of material into a single structure by means of an adhesive composition between their inner surfaces. By this process combinations of materials can be formed which possess new and better functions.

Lamination makes it possible to form a structure in which many excellent properties can be achieved, depending upon the choice of ply material and the kind and formulation of the adhesive or laminating agent. The choice of ply materials controls the strength and durability of the finished structure and the kind and degree of chemical function which it will perform.

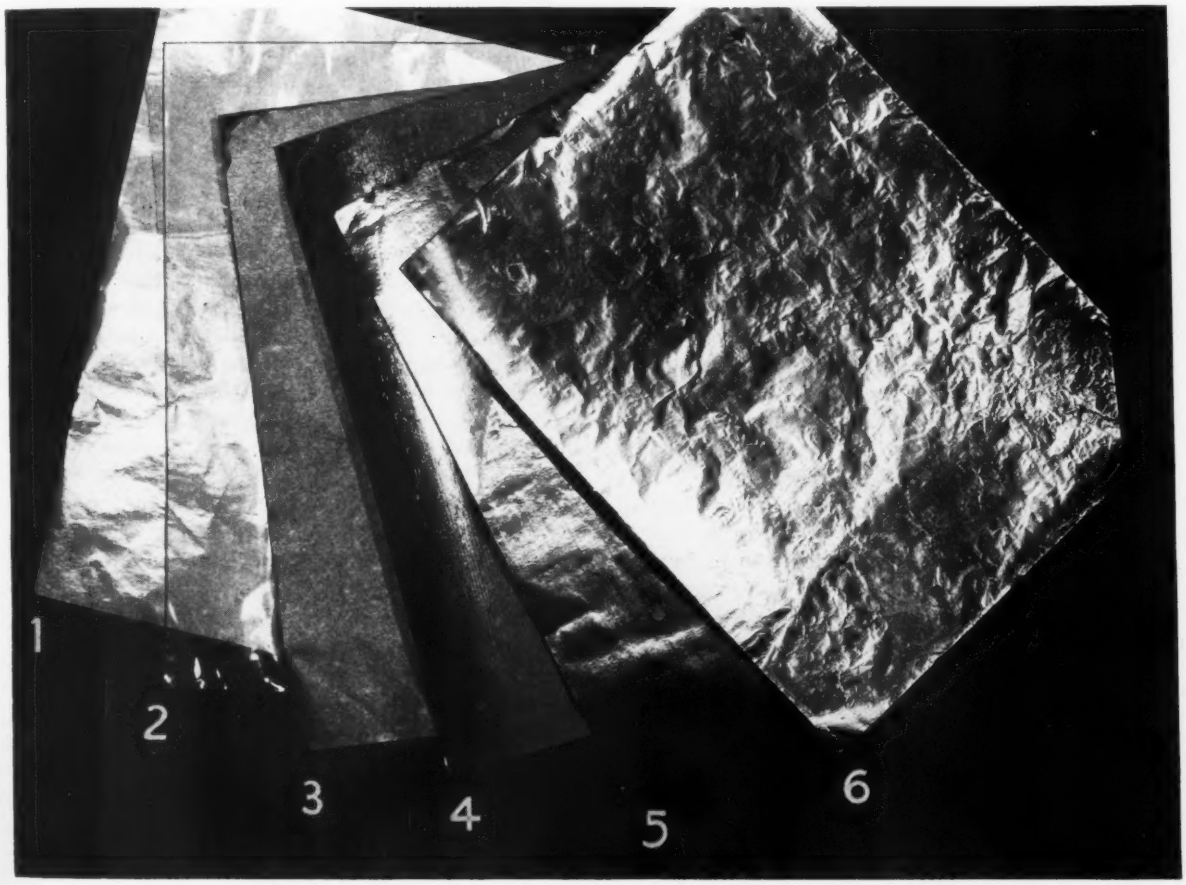
The laminating agent contributes little or nothing to actual strength, but its composition will affect pliability and durability, and in many cases it determines the chemical functions of the final laminate.

There are many packaging materials which, by themselves, do not provide sufficient function to be either satisfactorily or effectively formed into a package. By laminating these materials, it is possible to develop a final combination for a variety of functions not otherwise possible.

It is a well-known fact that there are certain limitations in the use of surface-coated materials which affect their use in many package-forming operations. For example, because of the difficulty of adhesion and the fact that surface coatings are subject to abrasion, it is not always possible to develop sufficient mechanical strength and other functions in a single coated sheet. However, by modifying a coating material to give the same functional characteristics and greater adhesive qualities, the material may be used as a laminating agent and can be applied as a continuous film between two plies of paper, cellophane, or similar materials.

The final result will be a laminated combination, then, that has greater durability because the film is pro-

A range of new protective properties may be achieved through lamination: (1) Triple-ply glassine; (2) laminated cellophane; (3) two plies of wet-strength kraft-to-paper; (4) kraft-to-moistureproof-cellophane; (5) a laminate made of coated lead foil, kraft and scrim cloth; and (6) aluminum foil and cellulose acetate sheet.



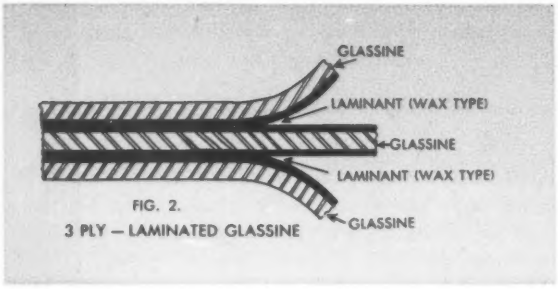


FIG. 2.
3 PLY — LAMINATED GLASSINE

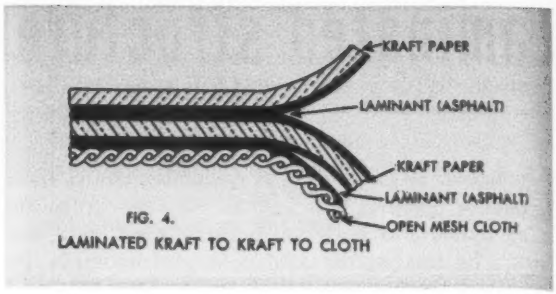


FIG. 4.
LAMINATED KRAFT TO KRAFT TO CLOTH

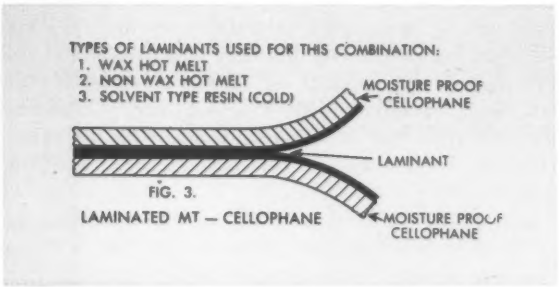


FIG. 3.
LAMINATED MT — CELLOPHANE

tected against abrasion and fractures by folding, and furthermore can be adhered by conventional adhesives. Such a resulting structure also has good working characteristics because it is softer and has less surface smoothness. The most important element in a compound laminated structure is the material used between the plies because the choice of this material determines the pliability and resistance to delamination in use. Also the choice and formulation of this laminant determines the kind of equipment on which the material must be made and the quantity that must be applied for the most efficient development of any particular function.

A very good example of a laminated structure which has found increasing commercial use consists of two plies of glassine paper combined with five pounds per ream of a waxy laminating agent. Glassine paper, in itself, is greaseproof and flavor-tight, but in normal weights it does not possess great physical strength and it has no resistance to the transmission of water vapor. By combining two glassine sheets with a continuous layer of a waxy laminant, the resulting structure possesses all of the attributes of the original sheets and also has greater pliability, in addition to a low level of water-vapor transmission.

If these same functions were accomplished by means of surface coating of a waxy type, it would necessitate a heavy glassine sheet with added plasticizer and this material could not readily be used in fabrication operations because it would require special adhesives and the surface coating would be very susceptible to mechanical abrasion and degradation.

Any metal foil, resinous or cellulosic film, paper, cloth, etc., may be used for the plies of a laminated structure and in many cases combinations of dissimilar materials are necessary to develop the necessary functional properties. Furthermore, laminated structures can theoretically possess any number of plies, although cost and other practical limitations usually limit this number to three or four. There are, however, some limitations as to the combinations of materials which can be laminated, because of differences in dimensional stability, effect of heat or aging. For example, a combination of nonmoistureproof cellophane to a plastic film, such as Pliofilm, would result in a laminated structure one side of which would be affected by a dimensional change depending on the humidity of the air, while the other side would be independent of such dimensional change. The resulting combination would be prone to curling, puckering and would be extremely difficult to fabricate.

It is also inadvisable to try to laminate plastic water-insensitive films with aqueous adhesives because such adhesives are usually less plastic than the films themselves and would not provide the strength and durability of bond necessary to develop the maximum durability of the finished structure.

Resinous films or plies with heat-sealing coatings should be laminated with an agent which has a sufficiently high melting point or suitable flow characteristics in order to obviate squeezing the agent out of the area at the point of heat sealing. A good example of such a combination is laminated Pliofilm, which is used for Method II packaging of metal products for export shipment. (See p. 861.) This structure consists of two Pliofilm sheets combined with a moistureproof laminating agent, which is so formulated that it does not melt or flow when the Pliofilm is heat sealed and, furthermore, maintains its ply strength at the heat-sealing areas. The latter is a very important point, because if the laminate is dispersed or otherwise affected at the heat-sealed areas the finished seam will show delamination or will not have sufficient strength for the outer ply to carry its proportional part of the load. In other words, the inner ply alone would be forced to carry stresses resulting from filling, handling and shipping, and the delaminated areas around the seal would have a lower resistance to the transmission of water vapor than the original structure.

The plasticity of the laminant should be such that it will not harden or crack at the temperature at which the final structure will be used. Such an embrittlement or limitation of the working temperature range of the laminant would result in either delamination of the plies or actual perforation if the structure were to be flexed.

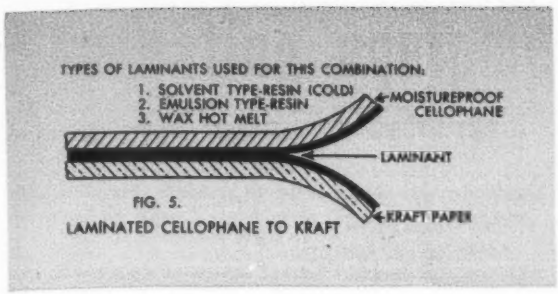


FIG. 5.
LAMINATED CELLOPHANE TO KRAFT

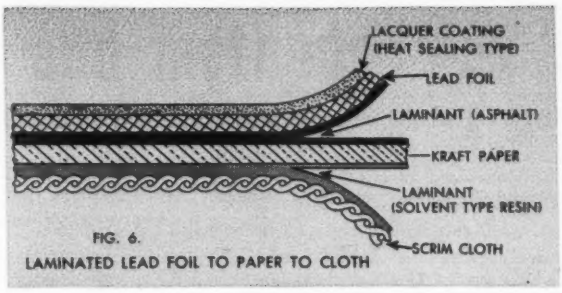


FIG. 6.
LAMINATED LEAD FOIL TO PAPER TO CLOTH

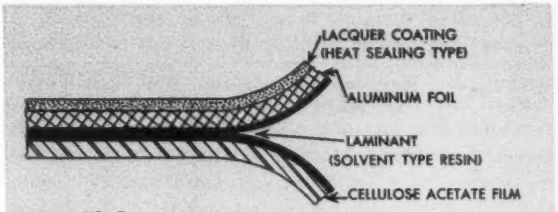


FIG. 7.
LAMINATED ALUMINUM FOIL TO ACETATE

Many laminated structures appear to be more flexible than the original materials because of the increased bulk and weight, but the true value of such plasticity can only be ascertained by exposing the finished structure to low temperatures. Flexing at various low-temperature levels will show that a temperature will be found at which either the laminant or the plies will fracture or become brittle independently of each other. It is not possible for the plies or the laminant mutually to plasticize each other and give a lower working temperature than either possesses independently. There are cases where the plasticizer of either the plies or laminant will migrate from one component to the other. If this occurs, embrittlement of the laminant results if its plasticizer migrates into the plies or softens if it gains plasticizer from the plies.

In either case, the laminated structure is degraded because the more brittle laminant will limit the working temperature range and a softened laminant usually loses its adhesive strength and delaminates at heat seals or at the edges.

Table I, p. 654, summarizes the characteristics of different types of laminating agents, their properties and uses. This chart is not a complete pattern of all laminants, because there are many possible combinations of materials and types. For example, an aqueous emulsion can be made of a resin mixture dissolved in a solvent. Such a laminant would perform in some respects like both an emulsion and a solvent type depending on the ply material, the composition, and the choice of solvent. Also, each type of laminant is susceptible to a wide range of formulations which affect its operating, functional and use characteristics. Thus there is the possibility of considerable overlapping and duplication in use between each of these types.

The type of laminant is determined by the kind of ply materials, the functional and use requirements of the finished structure and the equipment available for its production. The particular formulation of any type of laminant depends on the surface characteristics of the plies and the process of making the laminations.

Any laminant must be formulated and adjusted to satisfy all of these factors to achieve an effective and durable finished structure. This adjustment of laminant is less critical if each ply is of the same material, but becomes more critical as the plies differ in kind. For example, many types and formulations of laminant can be used to combine two sheets of kraft paper. However, if the combination is to be a kraft sheet and a rubber hydrochloride film, for instance, the choice of effective laminants is immediately limited. The formulation must be carefully made and the equipment must operate with more precision and in a different manner. A laminant to adhere two distinct kinds of material must have the unusual property of having adhesion to two chemically and physically different surfaces. One surface may be water-wettable and porous, such as paper, while the other may be water-insensitive and smooth, such as a metal foil or certain resinous films. One surface may be wettable by solvent (a vinyl film) while the other may be smooth and solvent-insoluble (a metal foil).

The best way to appreciate the problem of the proper choice and composition of laminants is to dissect critically certain characteristic laminated materials which have performed outstandingly in civilian and war packaging. Examples of six materials are shown in Fig. 1.

Example No. 1 is a triple-ply glassine structure which has very low water-vapor permeability, high greaseproofness, and good package-forming characteristics. This structure is made by using approximately five lb. of a waxy laminant per ream (3000 sq. ft.) between each pair of plies of glassine. The laminant in this case is applied to the glassine stock above its melting point so that it has been completely liquefied. The second glassine sheet is brought into contact with the laminant and the combination run over cool rollers. This process is repeated twice to achieve a double lamination. The waxy laminant gives the sheet its plasticity and its water-vaporproof function.

Example No. 2 is a laminated cellophane which possesses high physical strength, softness, greaseproofness and a low level of water-vapor permeability. This structure is similar to the glassine structure described previously except that it is a single lamination and in

TABLE I—LAMINATING AGENTS

Type	*Example*	*Function*	*Use*	*Remarks*
AQUEOUS SOLUTION	Dextrins. Animal glue, etc.	Greaseproofness. Great strength	Usually for greater strength and stiffness	Low cost. Water to be removed after combining. Usually used on papers or water sensitive materials
EMULSION	Rubber (Latex), resinous, etc.	Waterproofness (limited). Limited water-vapor resistance	For absorbent sheetings and paper	Water to be removed before or after combining. Usually used on papers or water sensitive materials
SOLVENT SOLUTION	Resins or gums, synthetic and natural rubbers in solvent solution	Wide range of water-vapor resistance, waterproofness, greaseproofness	Wide range of flexibility and durability	Solvent to be removed before or after combining. High unit cost. May be used with any material depending on choice of formulation and application techniques
HEAT LIQUEFIED	Waxy, asphaltic, or resinous mixtures	Wide range of water-vapor resistance, waterproofness, greaseproofness	Wide range of flexibility and durability	Low to high unit cost. May be used with any materials. Wide range of application, temperatures from about 140° F. to 400° F. depending on composition. The so-called "hot-melt" types are used at the upper part of this temperature range

this case the laminating agent has been modified to have greater adhesive qualities because the cellophane surface is more highly finished and has a moistureproof lacquer coating. This particular laminant is a hot-melt type composed of paraffin wax with suitable modifying agents. The laminant contributes additional water-vaporproofness, since two moistureproof cellophanes are used.

Example No. 3 is a double-laminated structure which has been developed for high physical strength and waterproofness. This consists of two plies of wet-strength kraft-to-paper laminated with an asphaltic compound. This sheet is in turn laminated with an asphaltic compound to an open mesh cloth or scrim. The purpose of the cloth is to impart high tear resistance and general durability. The kraft supplies additional physical strength and body to the sheet while the laminant resists the penetration by water. The laminant is formulated especially to give limited penetration into the kraft, however, since it is applied at a temperature above its melting point.

Example No. 4 is a combination of kraft paper and a moistureproof cellophane. This particular structure was developed to make a strong greaseproof wrapper for metal parts packaging. The greaseproofness is provided by the cellophane, the strength by the kraft, and the laminant in this case performs the simple function of combining mechanically these two plies into a workable combination. This laminant is a solvent type carrying suitable synthetic resins formulated to give great adhesive strength and low temperature durability. This structure was made by applying the laminant to the cellophane, removing most of the solvents and then combining to the kraft while the adhesive was still in a plastic condition.

Example No. 5 is a three-ply structure, utilized extensively for Method II packaging of war materials. This consists of a coated lead foil laminated with an asphaltic compound to kraft paper. This combination is in turn laminated in a scrim cloth applied to the kraft side with a solvent-type resinous adhesive. This finished structure is an excellent example of a multiple function which can be obtained by the ply members and the laminants. This sheet has substantially zero water-vapor permeability, is completely greaseproof, waterproof, and has very high mechanical strength and durability. Furthermore, it is very easy to form into an efficient package because the lead foil side has been coated with a heat-sealing lacquer. The lead-foil-to-kraft laminant is an asphaltic compound formulated for low-temperature durability, high adhesive strength, and to have limited penetration into the kraft on which it is applied as a hot fluid. The cloth is laminated to the kraft-lead-foil combination by means of a solvent-type resinous adhesive. The solvent adhesive is applied to the kraft, the cloth is immediately combined to the wet adhesive and the solvent removed by the application of heat. In this case, solvent removal is easy because the porosity of the cloth allows rapid diffusion.

Example No. 6 consists of aluminum foil laminated to a cellulose acetate sheeting. The combination has been used for packaging soluble coffee and similar products. This structure has a nearly zero water-vapor rate, sufficient durability and physical strength for use in small packages and envelopes and is made heat-sealable by the addition of a coating on the foil surface. In this case the laminant is a solvent solution of synthetic resins formulated for its adhesive qualities to the metal surface and with solvents which will not soften or affect the cellulose acetate. This structure is laminated by applying the laminant to the acetate sheeting, removing substantially all of the solvents, then combining to the foil by means of heat and pressure. It is necessary to remove the solvents before the plies are combined, otherwise solvents would be trapped between the surfaces and would leave a deleterious effect upon durability of the laminated combination.

Laminating equipment and methods

by Oscar De Sylva

In the field of laminations, two-ply structures predominate. Not only are they economical and comparatively easy to manufacture, but the protective and decorative requirements of the greater portion of the products to be packaged are satisfied by a pair of webs suitably bonded together. In these are found combinations of film to film, film to paper or board, film to metal foil, film to cloth, paper or board to paper, paper to foil, paper to cloth, cloth to foil, etc.

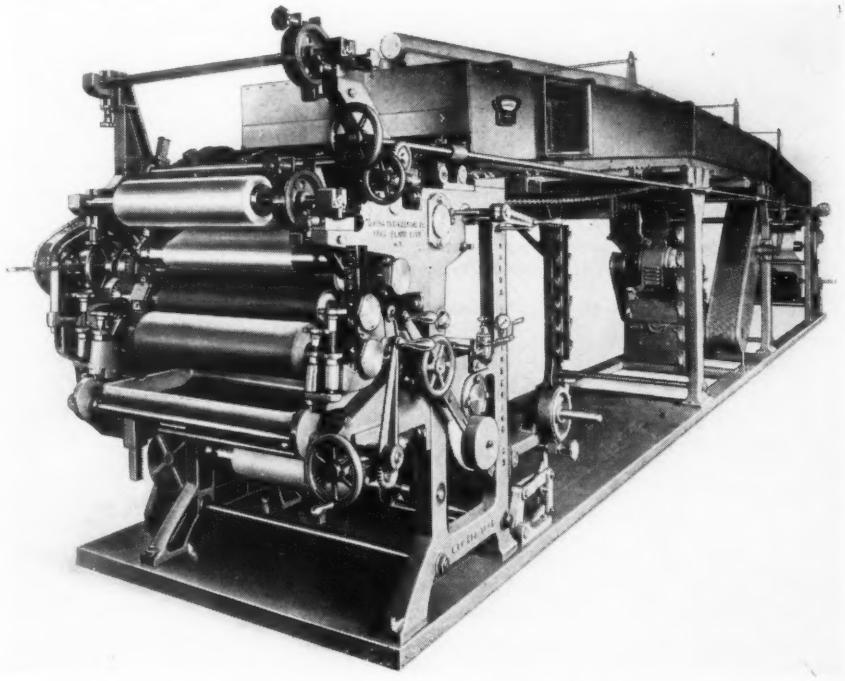
Three-ply structures are occasionally encountered; for example, three-ply glassines, or two glassines and film, or film, paper and foil. Laminations containing a greater number of plies are infrequent because no particular advantage is usually gained thereby. As the number of plies increases, economic factors come into play. Moreover, rigidity and poor working qualities develop, equipment and adhesive limitations become pronounced, and dimensional stability decreases—particularly when dissimilar materials are combined.

Since economic factors and manufacturing limitations regulate the weight, size (width) and gauge of cellulosic and synthetic resin membranes, it is found that equipment and methods must be adjusted to handle these materials adequately. Regenerated cellulose, because of its sensitiveness to moisture and its adaptability to fluctuations in the water content of the neighboring element, presents problems of combining peculiar to this type of material. Because of its sensitivity to water and the resultant dimensional changes which develop, this sheeting cannot readily be bonded to dissimilar materials to provide a permanently stable structure. Therefore a careful choice must be made with regard to 1) the other ply, 2) the type of laminant, 3) the method used and 4) the type of machine employed to produce the lamination.

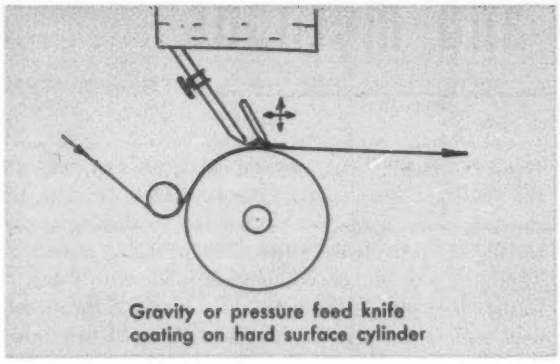
Films made from cellulose derivatives such as cellulose acetate, cellulose acetate butyrate and propionate are relatively insensitive to water vapor and thereby possess greater dimensional stability. Aside from this consideration, they possess enough rigidity and heat resistance to permit a large number of combinations of plies with similar or dissimilar elements, resulting in satisfactorily stable combinations. These sheetings, however, do not lend themselves well to combining with hot-melt type adhesives because of their sensitive thermoplastic properties. Coated regenerated cellulose films fare better in this respect, and many interesting applications have resulted therefrom.

Other resinous films, such as vinyl chloride-acetate copolymer, vinyl chloride and combinations of these with other synthetics (rubber polymers, etc.), are difficult to handle because they possess high values of extensibility. Combinations of these materials with similar or dissimilar plies can be produced satisfactorily if precautions are taken to provide the correct laminant and

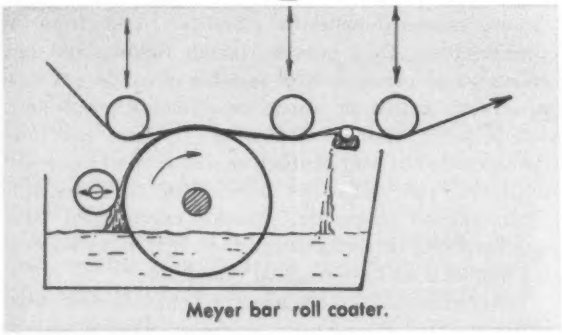
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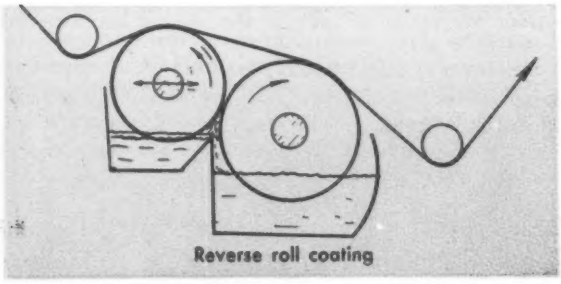
1—Developed mainly for laminating foil to paper, this centrally driven machine can also be used to laminate materials such as cellophane and glassine. Heavy construction of machine permits vibration-free operation at very high speeds.



2—Doctor-knife methods of adhesive deposition are particularly useful for high-viscosity coatings.



3—The Meyer bar method is popular for hot and for cold applications. Excess coating is recovered



4—Accurately made, smooth rolls apply light or heavy coatings uniformly. Changing horizontal position of upper movable roll results in metered action.

method. None of these resinous films, excluding cellulose esters, can be subjected to excessive temperatures in the laminating process without producing marked and troublesome dimensional changes. Other elements peculiar to the method and equipment which serve to enhance or moderate such effects, must be considered.

Cellulose materials—paper, paperboard and cloth—present fewer problems because of the favorable characteristics of these materials for lamination. High tensile strength, low distensibility and dimensional stability to relatively high temperatures, are attributes which make these stocks useful and comparatively easy to handle on all of the types of laminating equipment.

These characteristics, plus the insensitive nature of the materials to organic solvents, permit a wider choice of laminants and greater flexibility in the methods and equipment useful for combining them with other plies. Cloth, of course, presents problems that in some instances are not easily surmounted.

The importance of the laminant cannot be underestimated, for it is readily observed that the success or failure of the structure is entirely dependent upon this element. Present-day adhesives are designed specifically for one type or group of laminations. Consideration is not only given to the bonding power of an adhesive for any particular pair of plies but also to its contribution toward the stability, durability and functional values of the finished product. Furthermore, the laminant must be modified to conform to the peculiarities of the method and equipment used.

Laminants are broadly classified into two groups—solvent types for cold application, and hot melts. The latter can be further differentiated into wax and non-wax type resinous thermoplastics. In the solvent group, we find adhesives which effect the lamination by 1) fusion through the action of active solvents—the solvents affecting one or both of the plies; 2) adhesive solids deposition which, though tack-free when dry, will properly bond similar or dissimilar plies under suitable heat and pressure; 3) deposition of adhesive solids possessing high adhesive and cohesive properties which, when solvent-free, expose a tacky surface (the bonding of two or more plies is produced simply by pressing the two surfaces together); 4) deposition of adhesive solids from emulsions or suspensions wherein combining is effected before the liquid phase (commonly water) has been completely eliminated either through evaporation, absorption or both.

Hot-melt laminants, designed for high adhesive strength, must be heated beyond their melting points to a temperature which will provide enough fluidity for ease of application. Combining is effected by bringing the two plies together under suitable pressure and heat. The governing factors for methods, therefore, are ply characteristics and, more important, the properties of the laminant used. The fundamental requirement of laminating is that two or more plies are brought together into intimate contact and held in that state by a bonding agent or adhesive. Combining is effected by pressure, pressure and heat, or heat, and this only after the application of adhesive has been made to one or more of the surfaces to be combined.

In these cases, the plies involved must be maintained in a constant state of tension; otherwise, a discontinuous state will result in the lamination. Although this discussion has been focused on continuous web laminations, many of the foregoing features and controlling elements apply to sheet laminations.

Pressure combining dictates that the laminant must be in a tacky, adhesive state at the point of combining and that the pressure be great enough to bring the plies into intimate union, completely eliminating air and

voids between the plies. In heat combining, the adhesive is brought to a plastic state before combining. Pressure, though present, is not the controlling element.

To present a clearer picture of the processes used for combining, it is necessary to consider all the mechanical elements that come into play: first, and highly important, is the application of the adhesive to one or more of the surfaces to be combined; second, the drying system for removal of the solvents, if solvent type laminants are used; and last, the combining unit. To this we must add the other mechanical features which are indispensable, namely, unwind and rewind mill roll stands and mechanisms and tension control units. Equipment designed for the use of hot melts differs principally in that the drying system is not present. The control of heat to melt and apply the laminant becomes paramount.

The value and efficiency of laminating equipment depend entirely on the following characteristics:

1. *Adaptability of the machine*—Can it handle adequately films, papers and foils in the available sizes, weights, gauges and quality?
2. *Accuracy of the adhesive application*—Can it be accurately applied and controlled to fall within specification limits in uniformity, continuity and amount?
3. *Drying or solvent removal*—Is the equipment capable of evaporating the adhesive solvents at a rate rapid enough to provide economy of operation and without effect upon the continuity of the adhesive application?
4. *Web travel support*—Are the rolls rigid enough and in true alignment to withstand maximum web tensions without deviations?
5. *Combining rolls*—Can they be subjected to the pressure requirements without distortion taking place?
6. *Ply cooling facilities*—Is the cooling system adequate to permit top machine speeds?
7. *Temperature control*—Are the reservoirs, fountains, applicator rolls, drying ovens, cooling and combining rolls equipped to provide satisfactory control over each?
8. *Humidification*—Is the system equipped to control the moisture content of the stocks being processed?

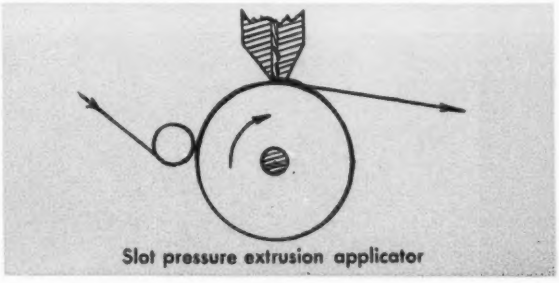
The most important and critical part of a laminating machine is the applicating unit. The main differences between laminating machines usually center about this member. As has already been pointed out, a satisfactory laminated product results only after a satisfactory adhesive application has been made. Numerous schemes have been devised to apply the laminant to one or more of the plies to be combined. The following illustrations point out the most popular schemes used today (Figs. 2–7).

Doctor-knife methods of adhesive deposition (see Fig. 2) are particularly useful for high-viscosity coatings where the weight of laminant being applied is not below 5 lb. per ream. Irregularities in caliper of the base sheet mirror a corresponding irregularity in the adhesive application. Paper stocks in the heavier weights will vary as much as $^3/_4$ of a thousandth of an inch from one side to the other. This means that at some point the adhesive deposit is extremely light and consequently the resultant lamination is unsatisfactory. On stocks which are of uniform gauge and which are insensitive to the components of the adhesive, this method of application provides continuity and uniformity of film not easily duplicated or excelled by other methods. Besides this, it permits higher solids applications which provide economies in solvents and increase production.

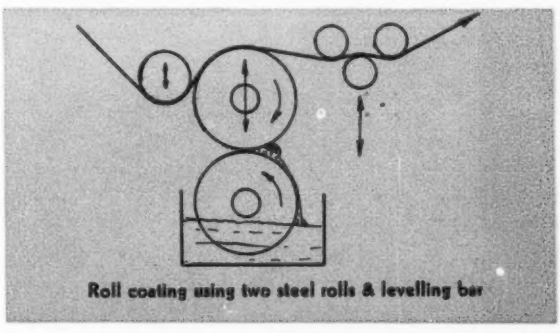
Roll coating by the Meyer bar (Fig. 3) is a popular and widely used method for hot and cold applications. The principal feature of this scheme is that an excess of material is applied by a roll to the web and directly beyond this point it is metered out by a wire-wound rod which presses against the web between two adjustable idler rolls. By varying the diameter of the wire, the space between turns changes proportionately so that different volumes of material will pass through. The excess is returned to the fountain.

This method lends itself well to a variety of applications if requirements are not too critical or extreme. Of prime importance in this method is the principle of tension control.

Insensitive rigid films run admirably well on this particular scheme or on its modified forms not only for cold, but also for hot-melt adhesive applications. One factor of importance is the necessity for changing the wire-wound rod when a change in the amount of ma-

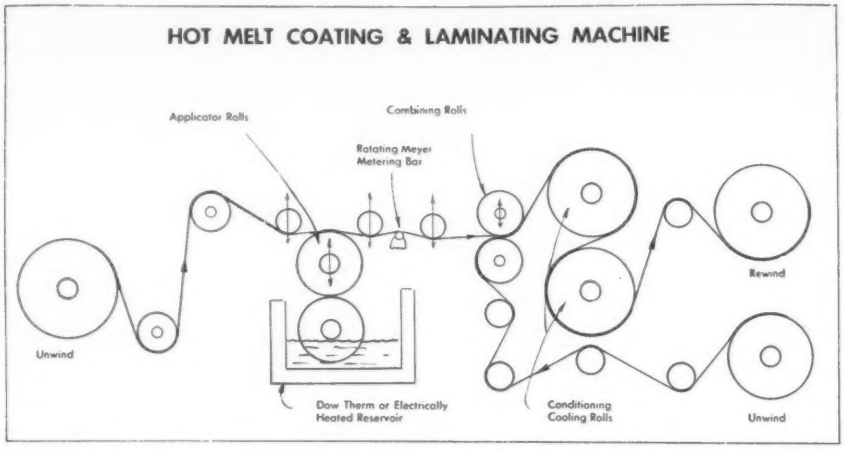


5—Control of liquid pressure and web speed permits continuous, smooth deposition of adhesive to film.



6—If metering is controlled, high viscosity adhesives in the heavier range function satisfactorily.

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7—A method, commonly used in the production of a three-ply structure in one operation, is successful, provided structure does not need different laminants between plies, or if penetration is not undesirable on materials which may be porous.

terial to be deposited is required. The diameter of the wire controls the metering action; therefore, to vary the amount of laminant, it is necessary to change to a rod wound with wire of a diameter which corresponds to the weight of coating desired. This consequently sets forth the prerequisite for a stock of wire-wound rods of different wire diameters for maintenace of flexibility in metering.

In contrast to the above-outlined method, two other schemes have found considerable favor in coating operations. One of these is illustrated in Fig. 4. In both cases, accurately made, smooth rolls are employed. The upper roll of Fig. 4 is movable on a horizontal plane, while the other roll remains in a rigid mounting. By changing the position of the movable roll, a metering action results. Another method is very similar with the exception that only one roll is used for the adhesive application. Both of these schemes are very useful because it is possible to apply very light and heavy coatings in a uniform manner. With control over the viscosity of the laminant, this technique provides a very accurate metering action.

The foremost disadvantages of these two schemes are that the adhesive applied does not transfer in a smooth manner, thereby necessitating some leveling device past the point of application, and that the reverse roll introduces a drag on the film or paper which limits the application to plies which are substantially rigid and insensitive to the components of the laminants.

Aside from this, lightweight applications of high-viscosity materials cannot be effectively made. One method (Fig. 5) can be used also as a reverse roll application if the arrangement of rolls and turning direction are reversed. In such a scheme the limitations are identical to those illustrated in Fig. 4. Both of these methods have been very successfully used with lacquer and resinous type adhesives in applications to cellophane, acetate film and paper stocks. Applications to distensible films are highly unsatisfactory, particularly when a lightweight coating deposit is required.

The roll coating method, as illustrated in Fig. 6, is extensively used for adhesive applications. If the unit is designed with good control over the metering or impression roll, very satisfactory applications to a variety of stocks can be made in a limited range of coating weights. Heavy applications of medium to low viscosity adhesives cannot be successfully accomplished by this method. High-viscosity adhesives in the heavier range of applications function satisfactorily. In practically every case, however, it is necessary to level out the coating by some smoothing device as illustrated. Otherwise, the ridge pattern formation resulting from the separation of the web from the coating roll impairs the value of the lamination.

The pressure extrusion method, as illustrated in Fig. 5, is not very widely used at present because of the complicated system required to maintain the method under accurate and flexible control. Nevertheless, such methods possess a high degree of merit in that, by controlling liquid pressure and web speed, continuous, smooth and uniform depositions of adhesives can be accomplished on a variety of stocks. On the other hand, porous structures, such as machine finished paper stocks, would not function well because of excessive penetration caused by the extrusion pressure of the operation. Therefore, we find this procedure more or less limited to nonporous plies possessing slight variations in thicknesses.

In the production of a three-ply structure, (Fig. 7) common practice is either to make the lamination a two-step operation or else to provide the laminating machine with two applicators.

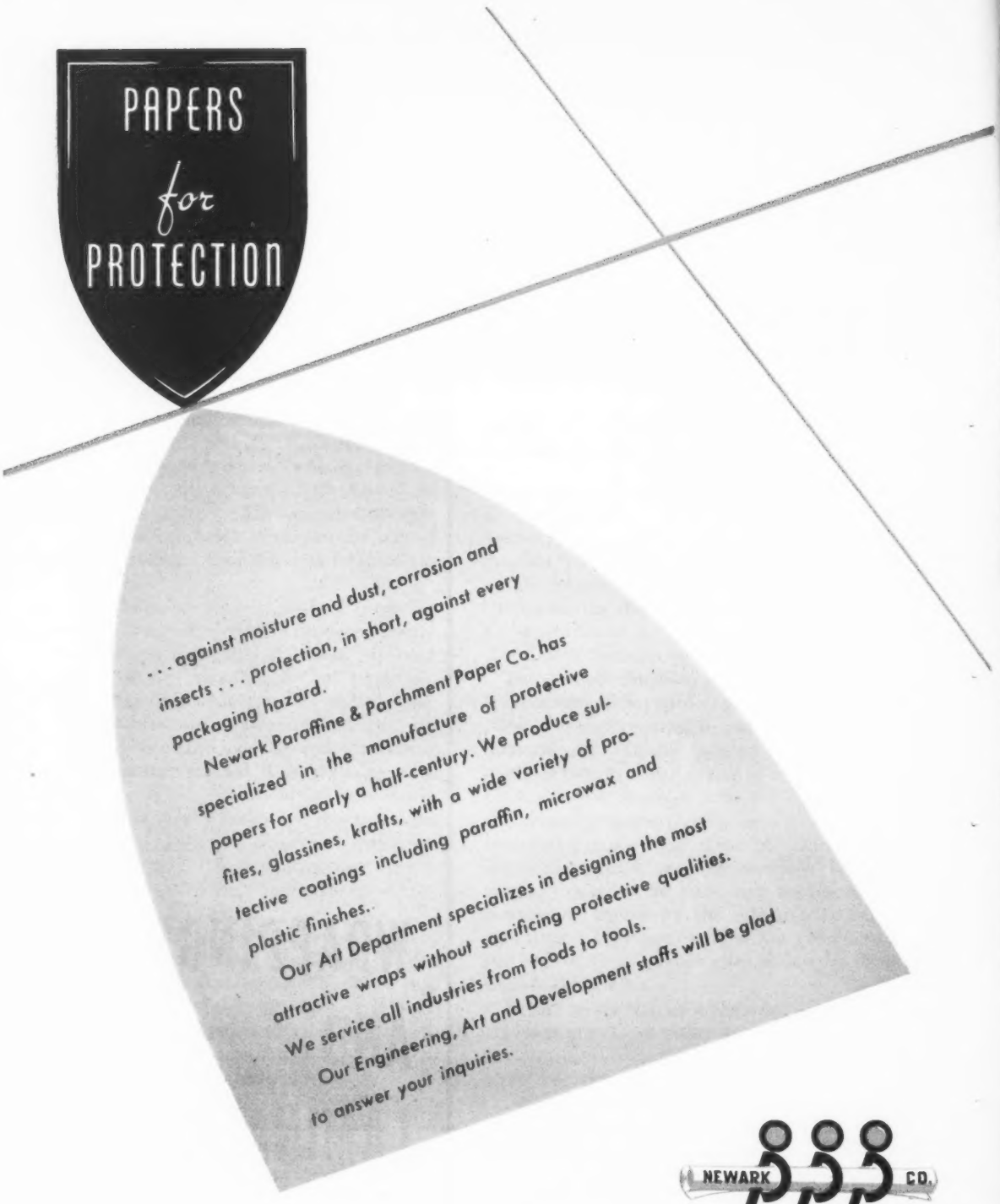
All of the above schemes can be somewhat modified so that the coating process can be better adapted to the peculiarities of the plies to be coated. In hot melt adhesive deposition, it is standard practice to provide controlled heat in the applicating roll or rolls so that lower melt temperatures can be maintained. After solvent type adhesives have been applied to one or more of the plies to be combined, it is necessary to remove the solvents, completely, before combining is effected at the draw rolls.

The "know-how" of lamination rests on a thorough knowledge of the materials which come into play and in the detailed design and control of the equipment and process.

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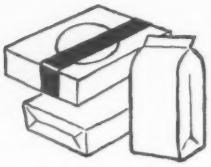
XUM

XUM

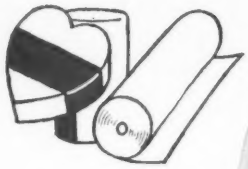

This is "Shell-Pli" an exclusive development of SHELLMAR. Shell-Pli is a natural for packaging your high quality products, and may be utilized as well, for the cover of the next brochure in which you will be taking particular pride.
FOR Every PACKAGING NEED
SHAR
SHELLMAR

XUM

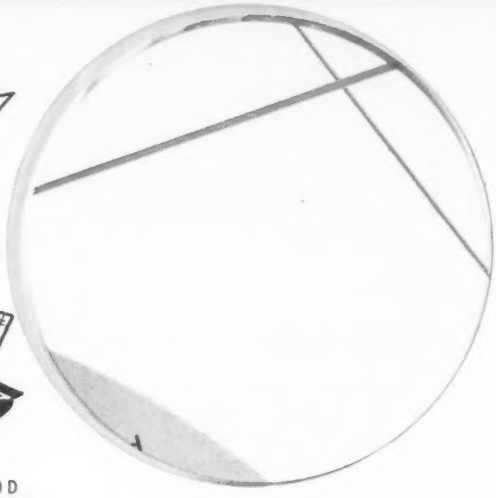
SCIENTIFICALLY *Engineered and Designed*

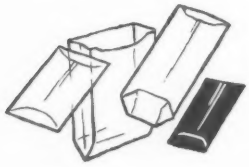


FROZEN FOOD
BAGS AND WRAPS

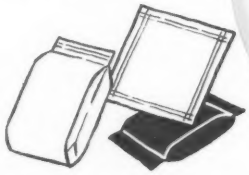


HOLIDAY BANDS
SHEETS AND ROLLS

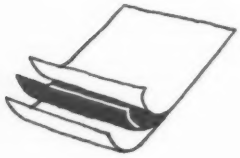




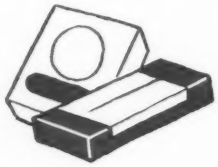
STOCK AND CUSTOM
CELLOPHANE BAGS



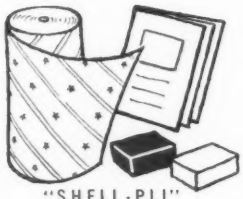
DEHYDRATED FOOD
BAGS AND POUCHES



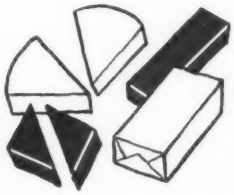
FUNCTIONAL LAMINATED
AND COATED MATERIALS



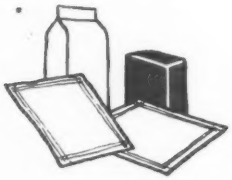
LAMINATED
WINDOW CARTONS



"SHELL-PLI"
"SHELL-GLO"



CHEESE POUCHES



"DEHYDRAPAC"
DEHYDRATED PACKAGES

Whether your product requires the functional properties of protective packaging, or the selling aid of eye-compelling beauty—or both—skilled craftsmen, working under the leadership of experts in every branch of the packaging art, and drawing upon SHELLMAR'S matchless resources of materials and machinery, are ready to serve you.

To discover what "SHELL-GLO" can do for your package or your advertising compare this page with the one opposite.

SHELLMAR

PRODUCTS CORPORATION

MOUNT VERNON, OHIO SOUTH GATE, CALIFORNIA

Sales Offices in Principal Cities


BY SHELLMAR
FOR Every PACKAGING NEED
FLEISCHMANN'S FAST RISING DRY YEAST
RICE
FROZEN FRESH
NET WT. 1 LB.
...WITH SUGAR
WASHBURN'S
Fancy
PINTO BEANS
WASHBURN'S
"JUNKET" RENNET POWDER
RENNET-CUSTARDS
WRIGLEY'S SPEARMINT CHEWING GUM
Cookquik
TRIAD BRAND
PEAS
Talkies

THE Milgate LINE

PROTECTS · GLAMOURIZES · SELLS

Indications are that the year 1946 will see conditions in the paper industry approach normal.

The Milgate Line of Specialty Papers regularly includes all types of cloths, acetates, foils, boards, glassines, cellophanes and papers, "hot-melt," emulsion, or solvent coated and/or laminated. Analine printing and roll embossing add to its versatility.

Not all of these items will be available during the early months of the year, however, we hope to be able to offer a more complete line as the year advances.

An invitation is extended to both old and new customers to send us their inquiries. Samples and price lists of the line as of date of inquiry will be supplied . . . samples and price lists of new items as they are added will be in your hands promptly.

Our comprehensive laminating, coating and converting equipment; the services of our experimental laboratories and technicians; our wide experience in handling coating, laminating, and other converting operations, all insure the quality of the Milgate Line.

Laminated, Coated and Printed Papers

PACKAGING DIVISION

E. W. TWITCHELL Incorporated

MILLS: Hamburg (Sussex Co.,) N. J.
OFFICES: 760 Public Ledger Bldg.
Philadelphia 6
Pennsylvania

XUM

it's WESTERN

for distinctive modern packages



- Frozen Food Bags and Wraps
- Flexible Liquid Containers
- Dehydrated Food Bags and Pouches
- Stock and Custom Cellophane Bags
- Protective Shipping Case Liners
- Method I-A Materials
- Functional Laminated and Coated Materials
- Cheese Pouches
- Printed Rolls, Sheets and Bags
- Bottle Cap Lining Material
- Holiday Bands Sheets and Rolls
- Electrical Insulating Material
- Method II Materials

Converters and designers of packaging materials, including laminated and coated metal foils, transparent films, fabrics and paper.

Staffed with technicians, engineers and designers who are leaders in the packaging field, Western combines scientific research and development with practical knowledge and experience to supply you with packages that sell.

PACKAGING AND PLASTICS

WESTERN PRODUCTS INCORPORATED

Creative Engineering in Packaging and Plastics

NEWARK, OHIO

CONVERTERS OF LAMINATED AND COATED METAL FOILS, TRANSPARENT FILMS, FABRICS AND PAPERS

XUM

Let DOBECKMUN prescribe for your .

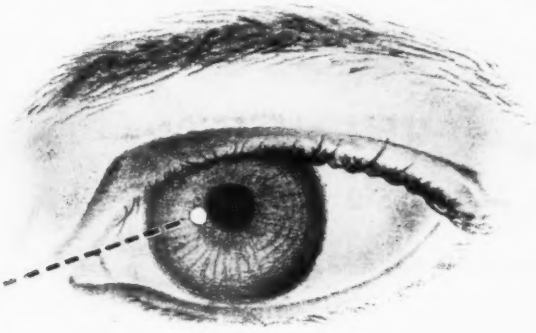


Samples from DOBECKMUN

These samples may suggest ways in which you can give your product better protection and greater appeal with Dobeckmun processed films or foils. Ask us for practical ideas or suggestions, without obligation.

XUM

"Packaging Headaches!"



High sales appeal plus positive protection featured in processed films and foils

Attractively multi-color printed, transparent film packages stop buyers . . . stimulate sales. Yet contents are guarded against air, moisture, odors and handling. You can have single thick or duplex cellophane—or tough, wax-laminated "Tritect"... in bags, sheets or in rolls for modern packaging machinery.

METALAM forms a metal barrier

Examine the sample of "Metalam". This permanent heat-sealing lamination of aluminum foil and film provides positive, permanent protection. The flexible metal barrier is impervious to moisture travel in or out, especially needed for hygroscopic or moisture-intolerant products. The transparent film supports the foil, and, when decorated with attractive designs, adds effective sales value.

Consider these samples for your own problem products. Or, ask our laboratories to help you combine protection with sparkling sales appeal. The Dobeckmun Company, Cleveland 1, Ohio.

CELLOPHANE
bags, printed or plain, single or duplex

FILMS AND FOILS
printed, in sheets or rolls

"ZIPTAPE"
opening tape for cellophaned packages

"TRITECT"
wax-laminated cellophane for extra protection

"METALAM"
heat-sealing lamination of processed film and foil

CREATIVE SERVICE
design, research, marketing

DOBECKMUN

SELF-SELLING PACKAGES IN PROCESSED FILMS AND FOILS

Branches at Boston, Chicago, Cincinnati, Los Angeles, New York, Philadelphia, San Francisco and Seattle. Representatives everywhere.

XUM

THILCO

SOLVES your packaging problems

with these FUNCTIONAL papers of sales appeal and protection...



WATERPROOF



WATERPROOF ASPHALT PAPERS

GREASEPROOF



GLASSINES AND GREASEPROOFS

FRESHNESS



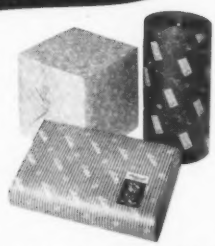
WAXED PROTECTION PAPERS

IDENTIFICATION



MACHINE DESIGNED PAPERS

DECORATION



PRINTED AND EMBOSSED WRAPPINGS

SPECIALTY BAGS



TAILOR-MADE BAGS

THILCO *Functional* PAPERS

THILMANY
PULP & PAPER COMPANY
KAUKAUNA · WISCONSIN

Printed wraps...

What does it look like? Is it in good condition? How about quality? Lumarith transparent plain and printed wraps answer the shopper's questions about a product. Unlike regenerated cellulose, Lumarith film is a true plastic. It won't dry out or become brittle. It is dimensionally stable and won't soften even when used to package wet-washed greens, meats or fowl. It won't affect taste of wrapped foods or tarnish metal. Lumarith film has an ideal printing surface. Its crystal clarity permits printing on inside of wrap.

COMBINATION WRAPS . . . LAMINATIONS

Lumarith film laminated to cardboard, metal foil, kraft paper, vinyl films or cellophane will answer a wide variety of packaging specifications. The ultimate in product protection or package beauty can be obtained by the laminating method. Lumarith in combination will provide wraps that are impervious to water, moisture, fumes, gases and all types of infestation. Lumarith-backed pressure-sensitive tapes are dimensionally stable, have excellent printing surface, and do not dry out.

Send for LUMARITH PLASTICS PACKAGING BOOKLET. It is a practical idea book for converters and product manufacturers. Celanese Plastics Corporation, a division of Celanese Corporation of America, 180 Madison Avenue, New York 16, N. Y.

Reg. U.S. Pat. Off.

See Other Celanese Advertisements
Pages 192-3, 269, 482-3



XUM



"step out WITH front"

More than ever before the PACKAGE has become a vital sales weapon — a powerful factor in attracting consumer attention to your product.

Your MILPRINT PACKAGE is designed for the consumer — the person who buys your product . . . and behind this package is the combined knowledge of the finest experts in the nation . . . Laboratory technicians whose constant research insures safe, protective materials — Industry experts who KNOW your product and how to sell it — Merchandising and survey men who fit the product to the market and make it COMPETITIVE — Creative artists with a vast experience in packaging design and color dynamics — plus the final craftsmanship that only 50 years of pioneering in packaging can impart to any package.

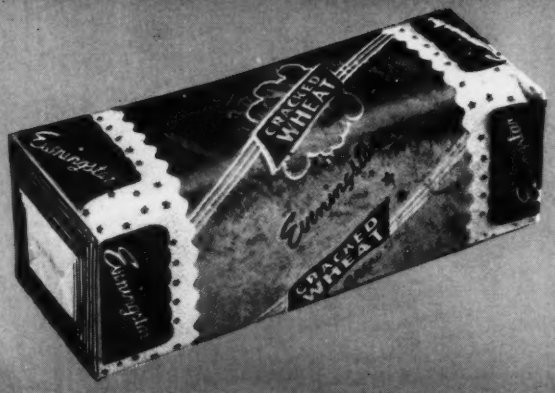
Why not avail yourself of this complete packaging service — and watch the consumer — as well as your sales — STEP OUT FRONT — with a new and better package.

8 POINT *packaging service*

Market Survey	Research
Industry Experts	Illustrative and Creative Art
Laboratory Tests	Nation Wide Service
Package Engineers	Technical Engineer

PACKAGES by milprint











MILPRINT Inc.

packaging converters • lithographers • printers

CREATIVE PACKAGING FOR ALL INDUSTRIES

Plants at Milwaukee, Philadelphia, Los Angeles, Tucson and San Francisco

•

Printed Cellophane, Pliofilm, Glassine, Aluminium Foil, Cellulose Acetate, Vinyl, Lacquer Coated and Laminated Papers in all forms, including Sheet Wraps, Rolls, Pouches, or Speciality Bags, Revelation Bread Wraps, Speciality Folding and Window Cartons, Counter Displays, Simplex Pie and Cake Units.

•

Sales Offices at • New York • Chicago • Boston • San Francisco • Philadelphia Grand Rapids • Los Angeles • Cleveland • Dallas • Minneapolis • Cincinnati Atlanta • Pittsburgh • St. Louis • Indianapolis • Kansas City • Memphis

XUM

A Cellophane for Every Packaging Purpose!



Distinctive, attractive Sylvania Cellophane offers a unique combination of functional qualities that make it indispensable as an underwrap or overwrap for a wide variety of packaged products. It possesses exceptional durability . . . heat seals to form a barrier against dust, air, grease and moisture, and is crystal clear.

We maintain a Research Department to help you in the development and improvement of your packaging. In addition we are equipped to give you expert advice on the growing industrial uses of Sylvania Cellophane.

SYLVANIA CELLOPHANE

Made only by SYLVANIA INDUSTRIAL Corporation

Manufacturers of cellophane and other cellulose products since 1929

General Sales Office: 122 E. 42nd St., New York 17, N.Y. ★ *Plant and Principal Office:* Fredericksburg, Va.

SYLVANIA CELLOPHANE

• Registered Trade Mark

GENERAL FELT PRODUCTS
DIVISION OF
STANDARD CAP AND SEAL CORPORATION
68 Thirty-Fifth Street Brooklyn 32, N. Y.



Cheese Wraps Processed With **PROTECOTE** *



Cheese Wraps processed with PROTECOTE embody the following characteristics:

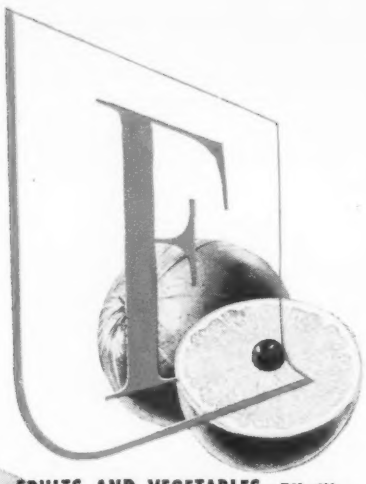
- NO ODOR OR TASTE
- EXCELLENT MOISTURE-PROOFNESS
- HEAT-SEAL AT CHEESE PACKING TEMPERATURE
- GOOD CLING TO CHEESE
- ADEQUATE FLEXIBILITY AND ADHESION AT LOW TEMPERATURES
- RESISTANT TO CHANGES IN TEMPERATURES AND HUMIDITY
- SEPARATE FROM CHEESE CLEANLY
- HIGH STRENGTH
- STRONG HEAT SEAL
- NON-BLOCKING
- ATTRACTIVE TRANSPARENCY

PROTECOTE Cheese Wraps are available with or without printing.

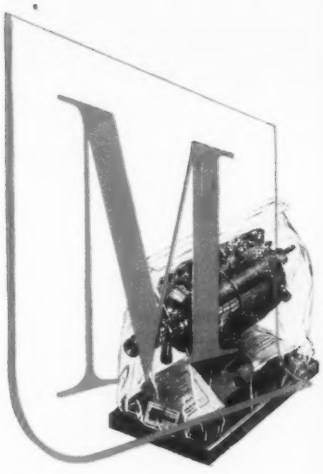
WRITE FOR SAMPLES AND QUOTATIONS

*Protective coating especially developed to preserve factory freshness of process cheese

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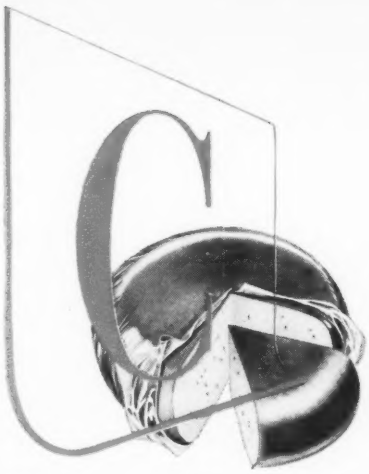
FRUITS AND VEGETABLES—Pliofilm keeps them tasty, juice-loaded for extra days, even weeks



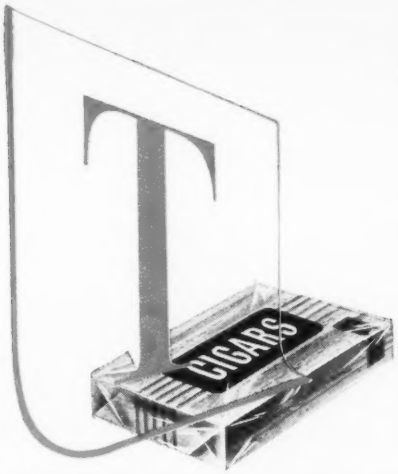
MACHINES—Pliofilm shields them against rust and corrosion, especially in export — simplifies crating and shipping

WHAT'S YOUR MOISTURE PROBLEM?

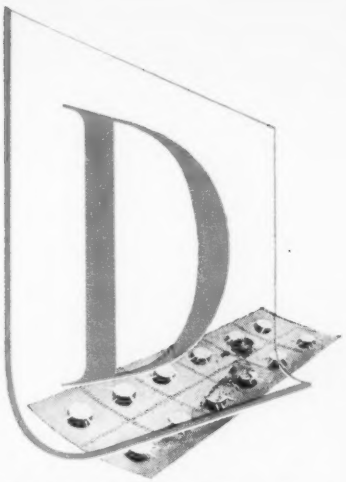
You'll Find the Answer



CHEESE—Pliofilm preserves flavor, prevents shrinkage, permits sale in economical, ready-to-use units

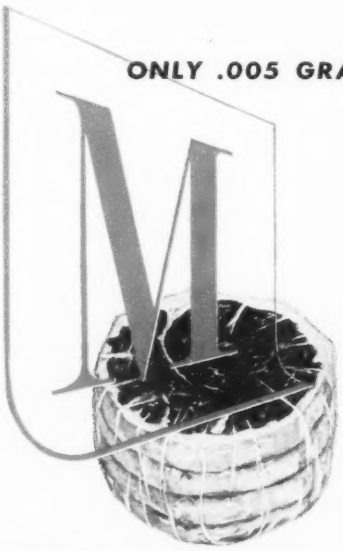


TOBACCO—Pliofilm guards against moisture-loss — locks in taste and aroma



DRUG PRODUCTS—Pliofilm is ideal protection for hygroscopic tablets and powders

ONLY .005 GRAM MOISTURE LOSS PER 100 SQ. INS. AT 0° F.



MEATS *FROZEN*—Pliofilm keeps them at quality peak — without loss of color or taste, without freezer burn



SEA FOODS *FROZEN* — Pliofilm insures top quality by sealing in natural succulence, prevents dehydration



JUICES *FROZEN* — Pliofilm safeguards flavor, preserves vitamin richness

in Transparent, Moistureproof

EVERYONE remembers the brilliant success scored by **Pliofilm** before the war in all types of moistureproof packaging.

During the war it gave indispensable protection as a sheathing for American airplane engines on their way overseas.

And now **Pliofilm** is on its way back, ready to serve you once again. If you have a product that will benefit by unfailing moisture protection, it will pay you to investigate this sheer, sales-appealing wrap. For complete information, write Goodyear, Chemical Products Division, Pliofilm Dept., Akron 16, Ohio.

Pliofilm

A PRODUCT OF

GOODYEAR

RESEARCH

Pliofilm—T. M. The Goodyear Tire & Rubber Company

XUM

PORT HURON SULPHITE & PAPER CO.

MILLS: PORT HURON, MICHIGAN

New York *Rochester, N. Y.* *Chicago* *San Francisco*



PAPERS FOR FOOD PROTECTION AND DISPLAY

COMPLETE protection implies delivery of your product in the same condition it left your hands. Choice of the proper papers for protection: packaging, compelling eye-appeal, inserts, instructions . . . in fact, all the way through the handling, is of major importance in insuring dependable distribution and delivery. Specify Port Huron Papers "all along the line" for:

PACKAGING

Candy Wrappers
Yeast Wrappers
Soap Wrappers
Super-Calender Papers
Tobacco Packaging
Cosmetic Packaging
Locker Papers

Baked Goods Protection
Razor Blade Wrappers
Toilet Tissue Wrappers
Carton Liners
Laminated
Moisture Resistant Papers
Grease Resistant Papers

Laminated Cellophane
Laminated Foil
Plain Waxed Paper
Gum Wrappers
Transparent Carton Wrappers
Printed Opaque

Printed Specialties
Printed Tissue
Waxed Tissue
Waxed Carton Wrappers
Frozen Food Wrappers

GENERAL AND CONVERSION USAGE

Laminating Papers
Transparent and Opaque Bag Papers
Tag Stock

Coating
Bristol
Bleached Waxing
Tabulating

Trunk Wrap
Twisting
Printed Soda Straw

Foil Backing
Creping
Carbonizing
Specialties

FINE PAPER MERCHANT LINES

HURON SILVERWING BOND
HURON SILVERWING BOND COPYSETTE
(9 sub. Watermarked Manifold and One-Time Carbon Interleaved)

HURON FEATHERWEIGHT BOND
HURON FEATHERWEIGHT BOND COPYSETTE
(9 sub. Manifold and One-Time Carbon Interleaved)

HURON OPAQUE BOND
HURON OPAQUE BOND COPYSETTE
(12 sub. Bond and One-Time Carbon Interleaved)

The New HURONETTE, Plate Finish
Formerly Port Huron Leatherette Plate Finish

HURON CARBON, One-Time

PORT HURON COVER, Leather Embossed

PORT HURON ANTIQUE COVER

PROTECTION PAPERS



FOOD PRODUCT IDENTIFICATION

the Modern Way

This sheet is a sample of McLaurin-Jones'

HEAT SEAL FOOD LABEL

Specially developed for banding and labeling foods and other preparations in conformity with Pure Food Laws. In the manufacture of the paper itself, all government regulations have been adhered to.

Technical detail: Temperature for proper heat sealing depends upon length of time of contact with heating element and amount of pressure applied. 250°-350° F. is satisfactory on most equipment. Sticks to moisture-proof cellophane at 250°-350° F.

We will be glad to supply you with additional test sample sheets.

The label samples shown here were originally produced on HEAT SEAL FOOD LABEL. They are reproduced by courtesy of St. Louis Sticker Co., St. Louis, Mo., and A. M. Steigerwald Co., Chicago.

McLAURIN-JONES COMPANY
440 MacLaurin St.
BROOKFIELD, MASSACHUSETTS

XUM



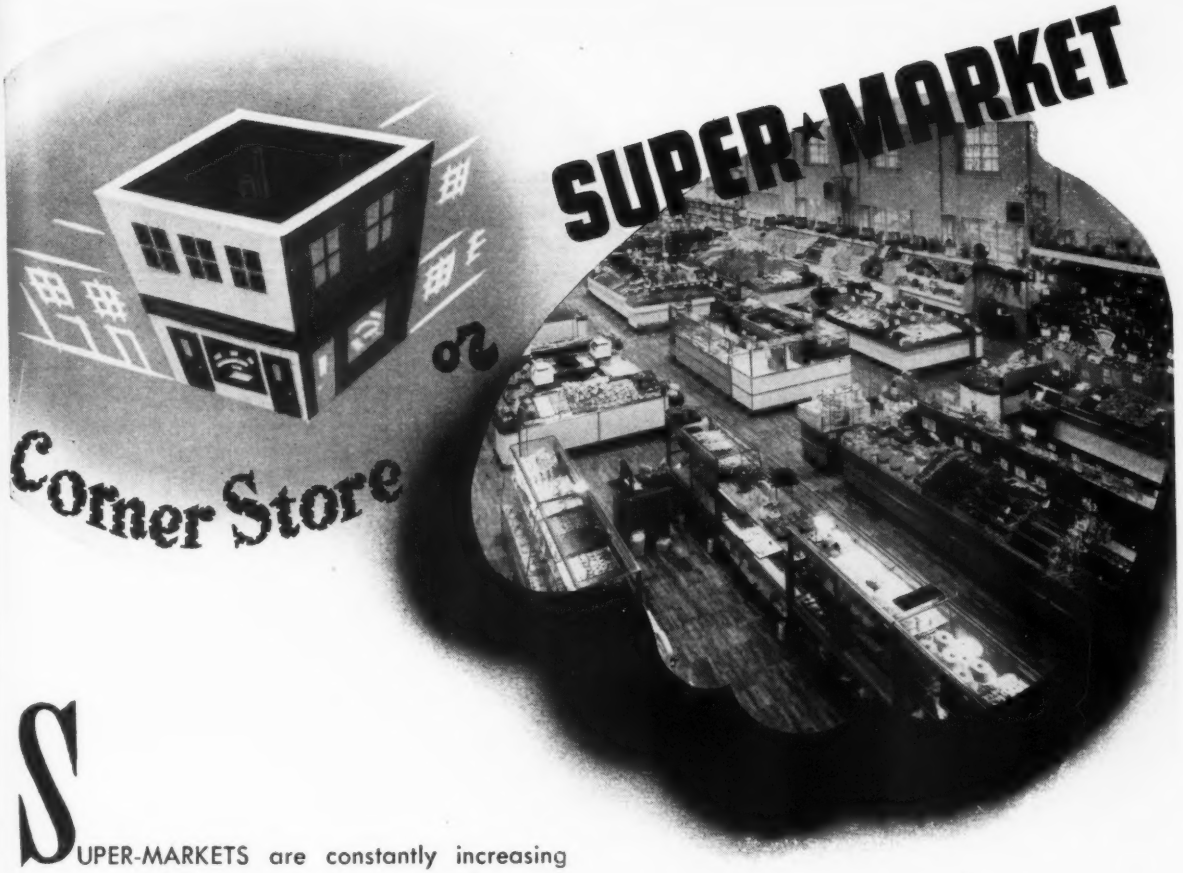
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SUPER-MARKETS are constantly increasing in popularity because the housewife finds everything she needs under one roof. It's a one-stop job that always saves time, and often saves money.

Like a balanced meal, packaging also requires careful shopping for many different materials. Each individual product must have exactly the right combination of appearance, protection, production efficiency and economy.

Riegel, many years ago a "corner store" with only a few highly technical papers, is now the largest "Super-Market" for printing, industrial and special packaging papers. They range from a 16 lb. glassine to a 400 lb. pattern paper, and the service we render is highly individual . . . adapting our papers to your needs.

Why not accomplish your objectives the "one-stop" Riegel way?

600 RIEGEL *Papers*

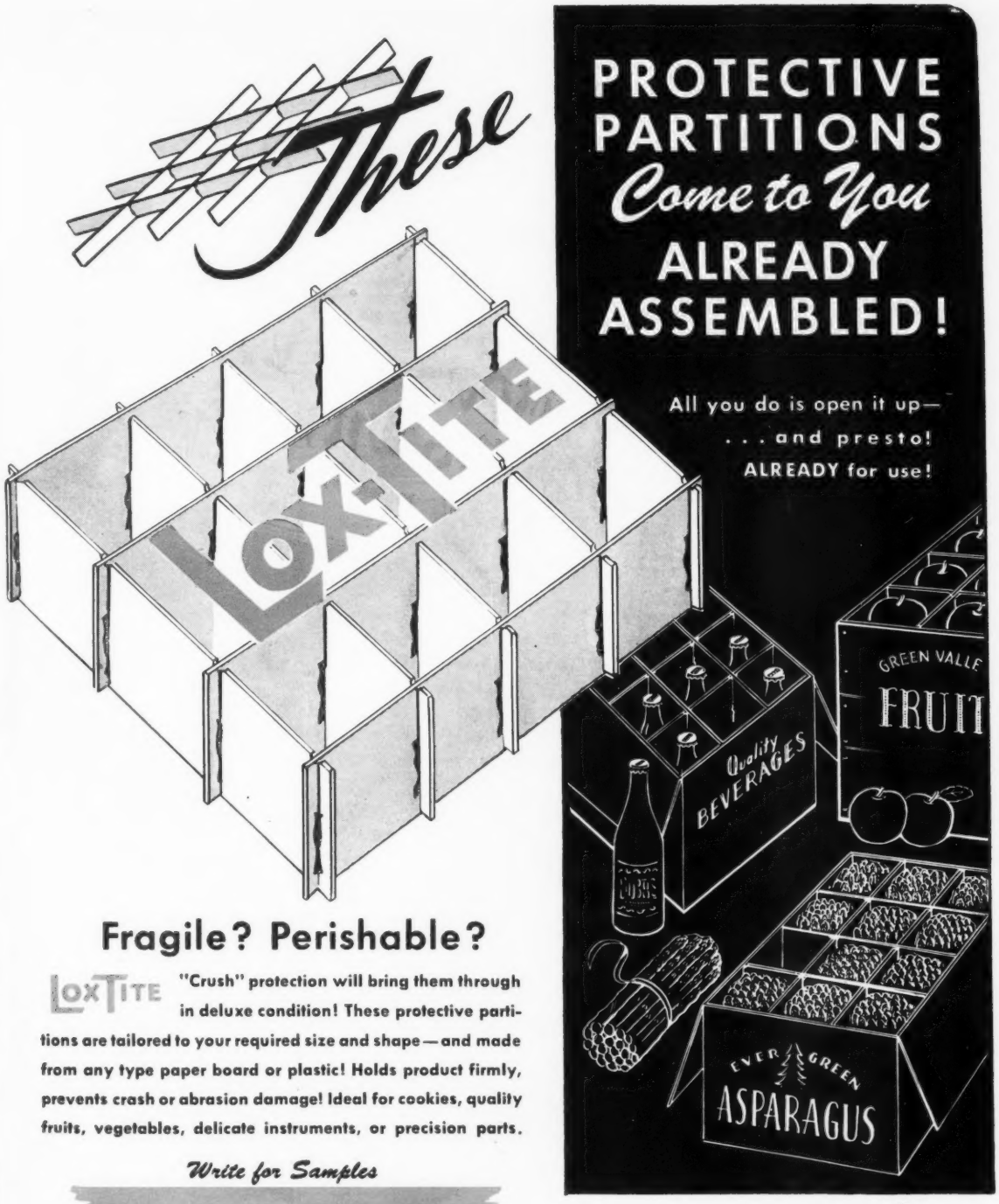
The Riegel sample files contain more than 600 different grades—a gold mine for the paper buyer who wants the best possible combination of protection, production efficiency and economy, to meet his own individual requirements.

We make glassine, greaseproof, sulphite, wet-strength—printed, embossed, resin-impregnated, laminated, oiled, lacquer-coated, waxed, dry-waxed—packaging papers, converting papers, printing papers and industrial papers in endless variety.

RIEGEL PAPER CORPORATION • 342 MADISON AVENUE • NEW YORK 17, NEW YORK

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Traver
offers packaging
"KNOW-HOW!"
FROZEN FOODS
FROZEN FOODS
● Self service—with 50% impulse sales—makes self-selling packages a must! Traver multi-printed cellophane meets every requirement of product protection, display, and descriptive information!
LINGERIE—HOSIERY
LINGERIE—HOSIERY
● Glamor for the shopper—garment protection and selling ease for the store! That's why so many successful merchandisers of lingerie—hosiery—gloves—accessories—are having their cellophane packagesdesigned and multi-printed by Traver!
sheer
HOSIERY
CONFECTIONS
CONFECTIONS
● Bar, Bag, or Package! Cellophane, glassine, or metal foil! Traver packaging insures your product perfect sanitation and protection, plus Sales Punch aplenty! Made for either hand wrap or automatic machines.
BAKERY GOODS
BAKERY GOODS
● Freshness sealed in—dust and moisture excluded—yet the appetizing goodness of your product has 100% display! Let Traver "know-how" design a package that gives you all this—plus SALES PUNCH!
INDUSTRIAL PLANTS
"ALL-SIZE" CELLOPHANE TUBING
2" to 20" wide, 1000 foot reels. Cut to any size bag, and heat seal! Cutting and sealing equipment available.
"TITE SEAL"
Cellophane bags, prefabricated to desired size, printed or unprinted. Heat seal—and you have protection, identification, and convenience for 100 factory uses!
MEATS
MEATS
● A multi-printed Traver wrap of transparent film works wonders in selling meats! That wrap says to the customer "you can see the meat you're buying, the brand name, the price, and the weight! Yet the meat is protected from all possible contamination!" The modern way of merchandising!
Traver
CORPORATION
Offices in principal cities—reply to
358 West Ontario Street • Chicago 10, Illinois
PACKAGING THAT SELLS!
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LOXTITE "Crush" protection will bring them through in deluxe condition! These protective partitions are tailored to your required size and shape—and made from any type paper board or plastic! Holds product firmly, prevents crash or abrasion damage! Ideal for cookies, quality fruits, vegetables, delicate instruments, or precision parts.

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Converters of Cellophane, Glassine, Foils, Pearlon-Plastic Films, Acetates, Protective Papers.

Packaged with Loxtite

and multi-printed cellophane wrap, your product has protection, eye-appeal, and sales punch plus!

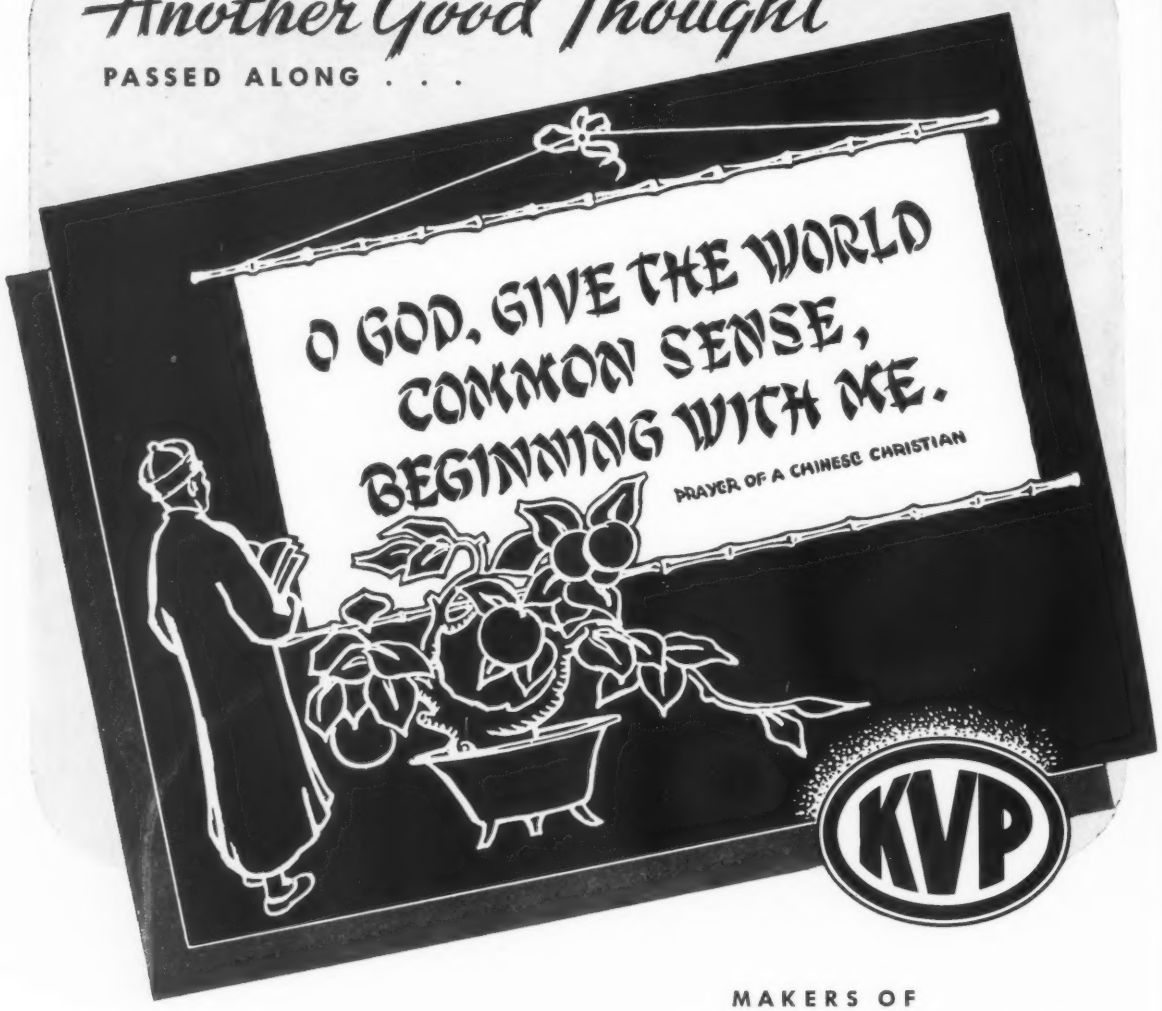


Loxtite Division
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XUM

Another Good Thought

PASSED ALONG . . .



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FOOD PROTECTION PAPERS

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GENUINE VEGETABLE PARCHMENT
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STAINLESS METAL FOILS

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Including the Famous "Continental Gloss" Line

FUNCTIONAL PACKAGING PAPERS

For Protecting Perishable Products



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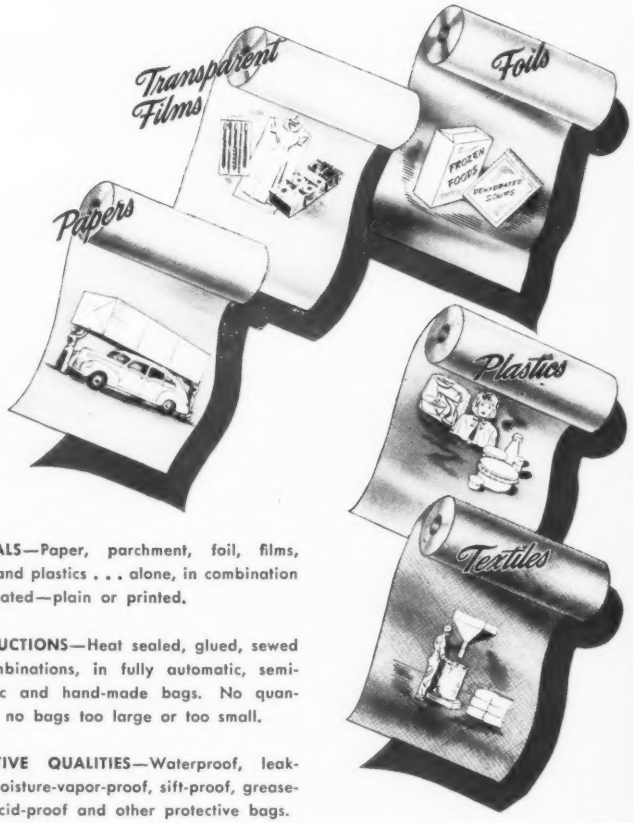
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There's a MEHL BAG for Your Product!

...from a large variety of materials...in all sizes...for all types of protection





MATERIALS—Paper, parchment, foil, films, textiles and plastics . . . alone, in combination or laminated—plain or printed.

CONSTRUCTIONS—Heat sealed, glued, sewed and combinations, in fully automatic, semi-automatic and hand-made bags. No quantities or no bags too large or too small.

PROTECTIVE QUALITIES—Waterproof, leak-proof, moisture-vapor-proof, sift-proof, grease-proof, acid-proof and other protective bags.

In the development of protective packaging for products, Mehl offers a versatility in manufacture that is unique in the packaging field.

We can develop a package for you that is *Custom-Made* to your specific need. And because every packaging problem varies in the amount and quality of protection desired, our facilities have been designed to provide a wide range of materials and constructions.

In addition to our own facilities, we offer those of the vast research laboratories of all the suppliers of our many varied materials.

We are in a position to provide prompt services in developing a *Custom-Made* Mehl bag for your product. Write, wire or phone us.

A DIVISION OF MEHL BAGS SYDNEY-THOMAS CORP.

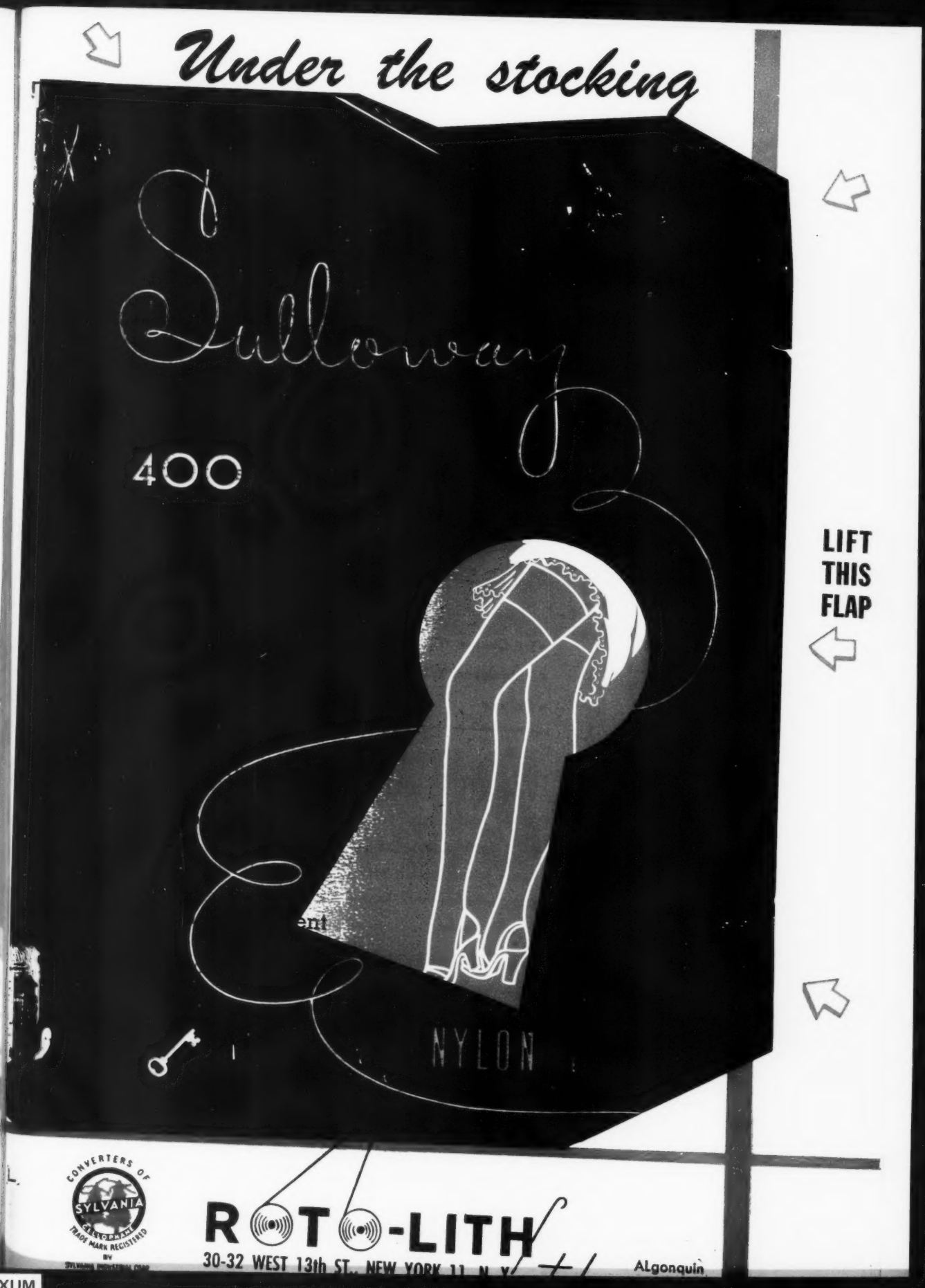
MEHL MANUFACTURING COMPANY

Division of Sydney-Thomas Corp.

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277 BROADWAY, NEW YORK 7, N. Y.

CONVERTERS OF ALL TYPES OF PROTECTIVE PAPERS... TRANSPARENT FILMS...FOILS...PLASTICS...AND LAMINATIONS


Under the stocking
Sulloway
400
LIFT
THIS
FLAP
NYLON
CONVERTERS OF
SYLVANIA
CELLOPHANE
TRADE MARK REGISTERED
BY
ROTO-LITH
30-32 WEST 13th ST., NEW YORK 11, N. Y.
ALgonquin

Sunbeam

400

NYLON

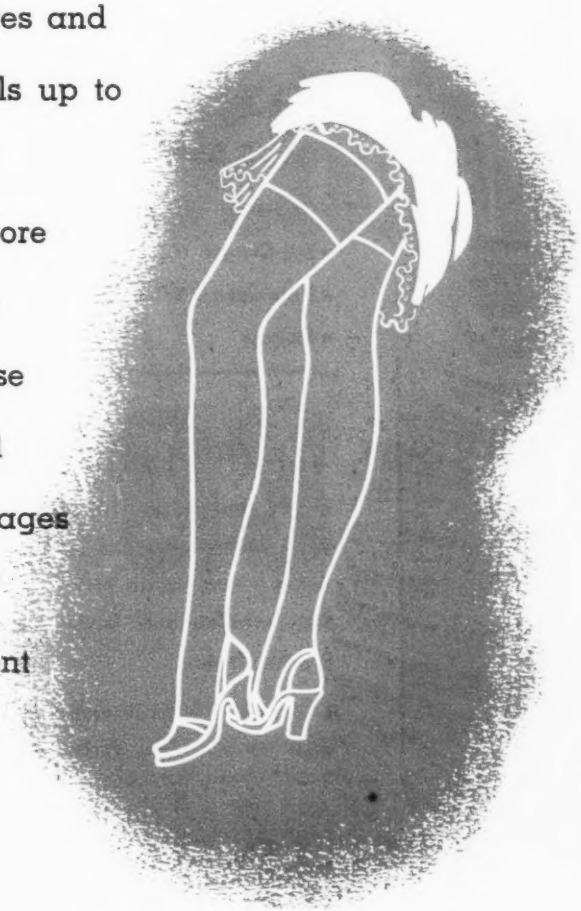
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Under the stocking package... an important message for you...

The Sullaway hosiery wrap is just one example of the fine color-printing we do on cellophane. We also print foils, acetates and other flexible materials up to four colors.

Our customers sell more goods on competitive markets partly because Roto-Lith designs and produces better packages for them.

Our design department will be glad to work with you.



LIFT THIS FLAP

CONVERTERS OF SYLVANIA CELLOPHANE TRADE MARK REGISTERED BY SYLVANIA INDUSTRIAL CORP.

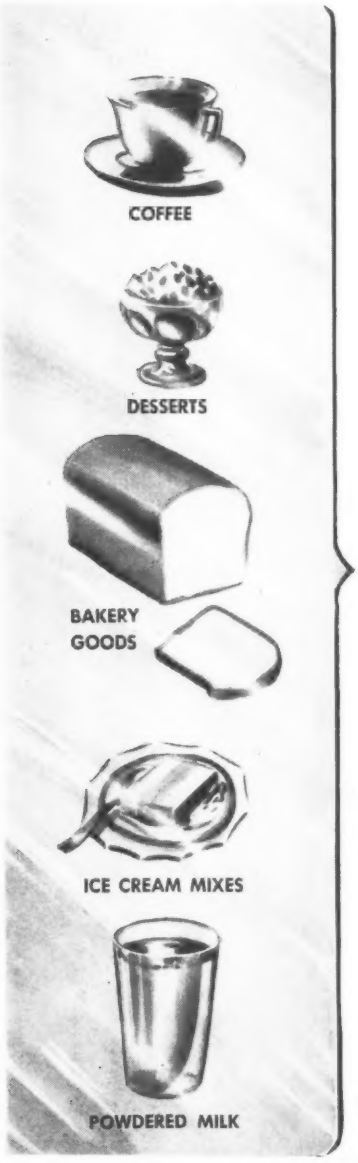
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Glassine Papers

For All Sizes of Packages



1 oz. to 100 lbs.



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- Desserts
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- Powdered Whole Milk
- Cocoa
- Frozen Foods
- Cereals
- Ready Mixed Flour
- Candy
- Bakery Goods
- Potato Chips
- Coffee
- Tea

WE COOPERATE WITH package machinery manufacturers and paper converters. Together we have engineered most satisfactory packages for the industries cited opposite. From a one-ounce serving to a bulk one hundred pounds of food whether wet, frozen, greasy or hygroscopic, our product is adaptable.

Our package engineers and laboratory technicians are available for your use. Write main office at Russell, Massachusetts.

WESTFIELD RIVER PAPER CO., INC.

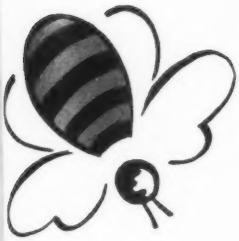
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MAIN OFFICE: **RUSSELL, MASS.**



your packaging ideas





will buzz like bumblebees, if you will forget the limitations of any one kind of paper or process, and put your problems up to an organization resourceful enough to make the material serve the idea.

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Nashua is headquarters for packaging papers — waxed, coated, gummed, printed, embossed and laminated; also transparent materials including cellophane, acetate, pliofilm and glassine.

Nashua stands ready to assist you in developing your packaging ideas.

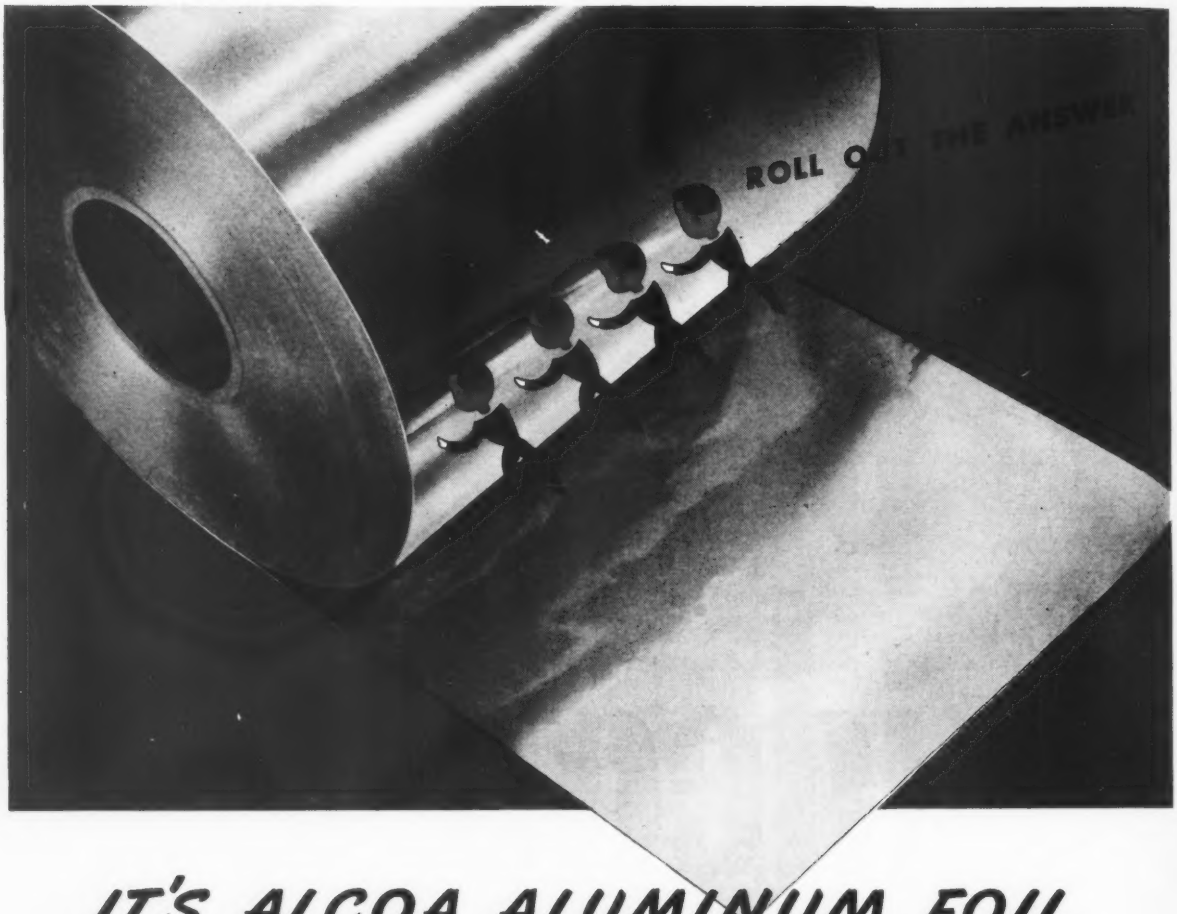
NASHUA GUMMED AND COATED PAPER COMPANY, NASHUA, N. H.

WANT BETTER PROTECTION?





WANT SPARKLING BEAUTY?



IT'S ALCOA ALUMINUM FOIL

Time and again it was proved during the war. When better protection was needed . . . when other materials failed to do the job . . . high priority aluminum foil was called for. What it did in war it can now do for you . . . solve your tough packaging problem better and economically.

You can't beat Alcoa Foil where protection from moisture-vapor is needed. Keeps moist products moist, dry products dry. Excludes all enemies of freshness.

It is odorless and odorproof. It is lightproof, gasproof, and greaseproof. It is tasteless and non-toxic. Among flexible packaging materials it is unsurpassed in the high degree and broad scope of protection afforded.

Coupled with this great advantage is its sparkling beauty. Foil leaps to the eye . . . has that "quality look" that helps make sales.

Other advantages include: high covering area per pound, because of aluminum's lightness; no dimensional change at high humidities; no loss of protective efficiency with age; dead folding, which facilitates wrapping and sealing; economical to use as a wrapper, liner, bag, packet, and other forms of packages.

IF YOU MAKE ANY OF THESE . . .



Baked goods	Coffee	Frozen vegetables	Milk (caps)
Beverage powders	Condiments	Hair dyes	Milk, powdered
Bouillon cubes	Cosmetics	Hair waves	Photo developers
Butter	Dehydrated foods	Ice cream powder	Photographic film
Cake mixes	Dessert powders	Instant coffee	Potato chips
Candy	Dried fruits	Machine parts	Smoking tobacco
Cereals	Fresh fruits	Meat products	Soap
Cheese	Frozen fish	Medical supplies	Soup mixes
Chewing gum	Frozen fruit	Medicinal powders	Tea
Cigarettes	Frozen meats	Medicinal tablets	Yeast
Cigars	Frozen poultry		

HERE'S HOW YOU CAN USE ALCOA ALUMINUM FOIL



Alcoa Foil, by itself, forms a satisfactory packaging material for products which require only a wrapper; for example, cigars, yeast, candies, and cheese. It can be supplied plain or embossed, lacquered in any color, or attractively printed. See data below.

If you wish to seal the seams or folds hermetically, Alcoa Foil can be supplied with coatings to accomplish that, by the heat sealing thermoplastic method. The bond that is formed is practically impermeable to moisture-vapor or gas transfer.

Alcoa Foil is also available from many converters in various laminated forms. These include laminations with transparent sheetings of several kinds, papers and paperboards, glassines, scrim, and other materials. These combinations often provide a better packaging material than the component parts alone would give . . . stronger, more highly protective, easier to form, or more attractive. Transparent sheets may be colorfully printed in reverse before laminating to foil, making an exceedingly attractive package.

In addition to being used as an outer wrap or inner lining, Alcoa Aluminum Foil may be formed into bags, envelopes, packets, boxes, cartons, tubes, and other styles of packages. For purely decorative value, it is widely used for labels and box coverings.

Consult your package supplier on how to use foil to best advantage in your package. Leading converters, bag and box manufacturers, paper companies, and package designers are doing more work with Alcoa Foil than ever before. For names of firms experienced in producing foil packages, consult your near-by Alcoa sales office or write ALUMINUM COMPANY OF AMERICA, 2150 Gulf Building, Pittsburgh 19, Penna.

DATA ON ALCOA ALUMINUM FOIL FOR PACKAGING

Standard Thickness in Inches	Nominal Covering Area in Sq. In. per lb.	Nominal Ream Weight 24 x 36—480 Basis	Maximum Width	Finishes
*.00035"	29,200	14.20#	26½"	Plain-Embossed-Lacquered or seal coated
*.0005"	20,500	20.28#	26½"	Plain-Embossed-Lacquered or seal coated
*.0007"	14,600	28.39#	26½"	Plain-Embossed-Lacquered or seal coated
*.001"	10,250	40.56#	26½"	Plain-Embossed-Lacquered or seal coated
.0015"	6,800	60.84#	26½"	Plain-Lacquered or seal coated
.002"	5,100	81.12#	26½"	Plain-Lacquered or seal coated
.0025"	4,100	101.40#	26½"	Plain-Lacquered or seal coated
.003"	3,400	121.68#	26½"	Plain-Lacquered or seal coated
.0035"	2,930	141.96#	26½"	Plain-Lacquered or seal coated
.004"	2,550	162.24#	26½"	Plain
.005"	2,050	202.80#	26½"	Plain

** Used in machine wrapping, as is, or with a supporting membrane for bags, box liners, heat-sealed packets, and packages.*

Gauges heavier than .001" are suitable for liners, sealed packages, and formed caps for package closures.

ALCOA

ALCOA ALUMINUM FOIL

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Custom-creators of packaging materials for specific product requirements

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PACKAGING PAPERS *Converted Papers* SPECIALTY PAPERS

DECOTONE PRODUCTS

Fitchburg Paper Company

Producers of:

MOISTURE-VAPOR PROOF PAPERS
PAPER-BACKED ALUMINUM FOIL
SPECIAL PROTECTIVE PAPERS
GREASE PROOF PAPERS
HEAT-SEALING PAPERS
LAMINATED PAPERS

Converters of:

TRADE MARK PAPERS
GREETING CARD PAPERS
DECORATIVE PAPETRIES
PRINTED, EMBOSSED BOX WRAPS
GIFT WRAPS
FOIL

YOUR PRODUCT may have characteristics which require special consideration in packaging. Decotone technicians will develop a packaging material to meet its specific needs. Each new order is an individual problem to us. Our research laboratories determine the exact material to meet every requirement.

Decotone can produce almost any combination of special coatings, cloth, foil, paper, acetate, cellophane or grease-proof lamination to resist moisture, corrosion, grease or food acids.

As a division of the Fitchburg Paper Company, we produce the base papers in our own mills, process and convert them in the Decotone plant — and thus control quality and characteristics from the pulp to the finished material. You are invited to consult a Decotone packaging engineer on your problems. Write today!

DECOTONE PRODUCTS

DIVISION

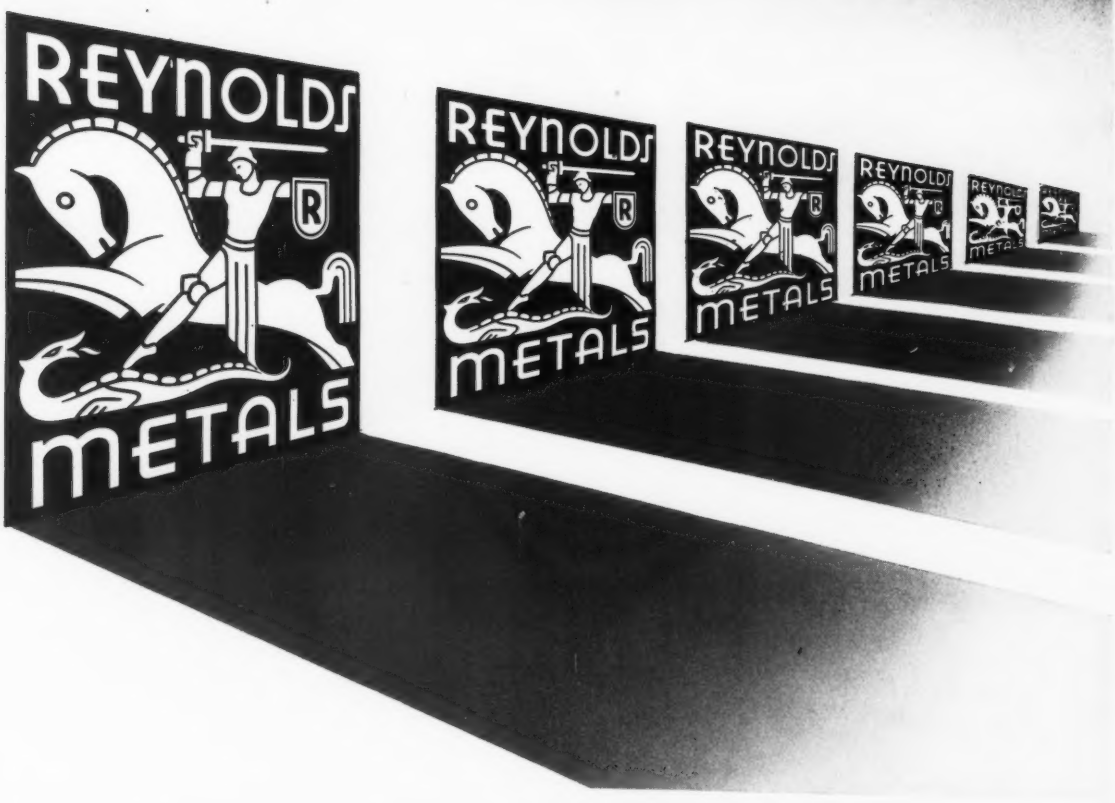
Fitchburg Paper Company

PACKAGING PAPERS *Converted Papers* SPECIALTY PAPERS

FITCHBURG, MASS.

XUM

THE LEADER IN FOIL PACKAGING IS READY!



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Watch Reynolds for revolutionary ...maximum protection



FOOD LABELS

Gleaming foil labels on cans and jars bring extra display value; more "buy" appeal; added distinction and beauty to your product.



CANDY WRAPS

Chewing gum, chocolate, mints—candies of all kinds —keep their freshness, hold their flavor longer when wrapped with Reynolds Aluminum Foil.



CARTONS

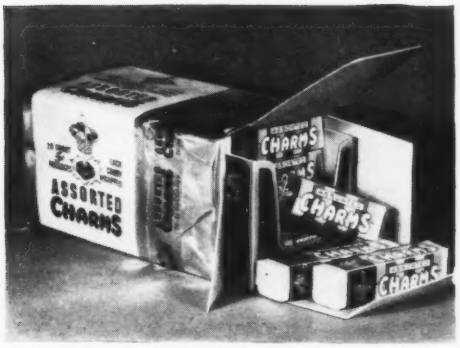
Foil cartons seal in the original fragrance, preserve delicate flavor from moisture, heat and light, give enhanced display value.



BAGS AND ENVELOPES

Reynolds Aluminum Foil envelopes safeguard potato chips, peanuts and other foods against the ravages of light, moisture and heat.

new developments ... sparkling eye-appeal



REYSEAL

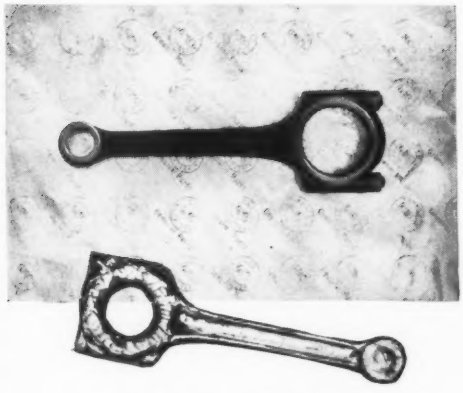
A new heat-sealed packaging material that gives complete moisture-proof protection, plus the eye-appeal of foil.



FOR BEVERAGES

Foil labels adhere tightly to bottles, even under water . . . never become torn and frayed from handling...give greatly increased brand-name protection . . . enhance package appearance.





METAL PARTS

A revolutionary development, combining "Cathodic Protection" against contact corrosion with all the sales appeal of aluminum foil.



EMBOSSED LABELS

Reynolds embossed labels of aluminum foil offer unlimited varieties of color, design and shape . . . bring a distinctive personality to your product that means greater sales appeal.

Complete **REYNOLDS** facilities are ready to serve you



SKILLED RESEARCH LABORATORY

Fourteen separate departments are constantly studying and testing new possibilities in foil, paper, films, adhesives, printing inks and methods. These facilities are at your disposal.



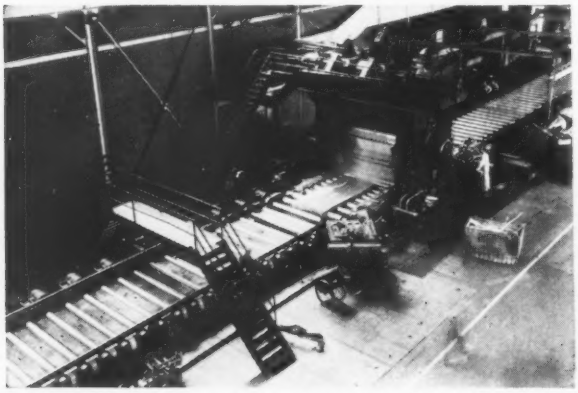
LARGEST FOIL PRINTING FACILITIES

For 25 years Reynolds has led the way in high-speed color printing on aluminum foil. Today plans are nearing completion for even larger facilities and additional colors to meet postwar trends.



ENGINEERING SERVICE

Reynolds technicians are ready to work with plant operators; to give specific advice on application and removal of Reynolds metal labels —how to make the best use of packaging accessories.



ENLARGED CAPACITY FOR FLEXIBLE METAL PACKAGING

90% of flexible metal packaging used during the war came from Reynolds plants. To the Packaging Industry this means increased capacity . . . improved facilities . . . greater skill.



COMPLETE ART & DESIGN SERVICE

Many of America's most outstanding packages were designed by Reynolds. This skilled staff is ready to help your product take full advantage of the selling allure that only foil offers.

Foil Division, Reynolds Building, Richmond 19, Va.

REYNOLDS ALUMINUM

REYNOLDS METALS COMPANY

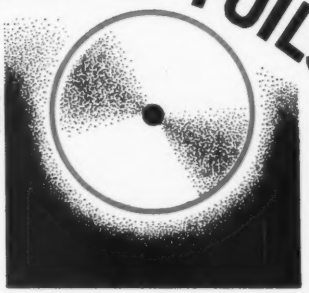
Leads the way in Foil Packaging

FUNCTIONAL PACKAGING MATERIALS



DECORATED AND PROCESSED

PAPERS-FOILS-FILMS AND TEXTILES



IMPREGNATING
LAMINATING
EMBOSSING
PRINTING
COATING

Our complete facilities for laminating, coating and decorating are available to help you meet any special packaging problem. Any material or combination of materials listed above can be utilized to do a specific job. The right functional packaging material for proper protection plus the right design for eye appeal will help to stimulate the sales of your product. We would welcome an opportunity to discuss your packaging problems. We are ready to serve you. May we have your permission?

Converter
CORPORATION

CLINTON, MASSACHUSETTS

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Paper
for FUNCTIONAL PACKAGING

Paper and paperboard play a major part in most packaging specifications. We have a variety of paper products, always in stock, and in large quantities.

- CARDBOARDS
- CORRUGATED BOXES
- CORRUGATED ROLLS
- GLAZED MARKING PAPER
- GUM SEALING TAPE
- (rolls and sheets) KRAFT PAPER
- NEWS
- TISSUE PAPER
- WATERPROOF PAPER
- WAX PAPER
- CORDAGE
- COTTON TWINE
- SISAL TWINE
- HEMP

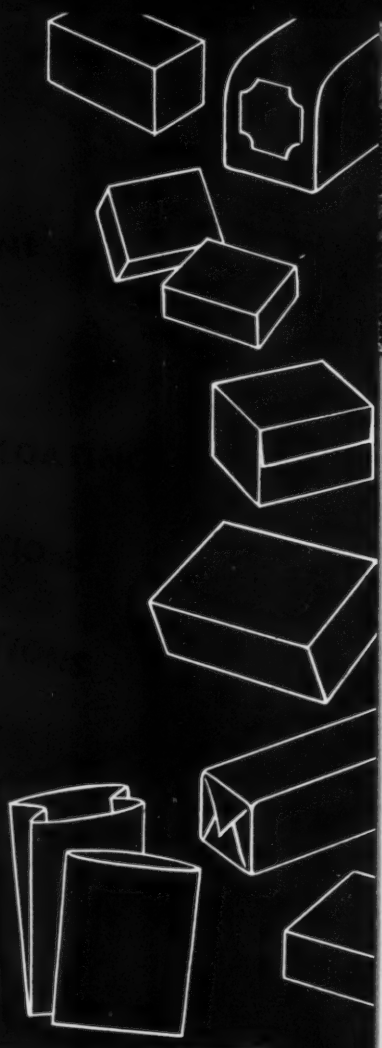
We also have other types of paper and paper products for shipping containers, box wraps, folding boxes, round paper packages, envelopes.

MERCHANT SUPPLIERS PAPER CO.

Mill Representatives • Paper and Cordage

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Packages Built for the job

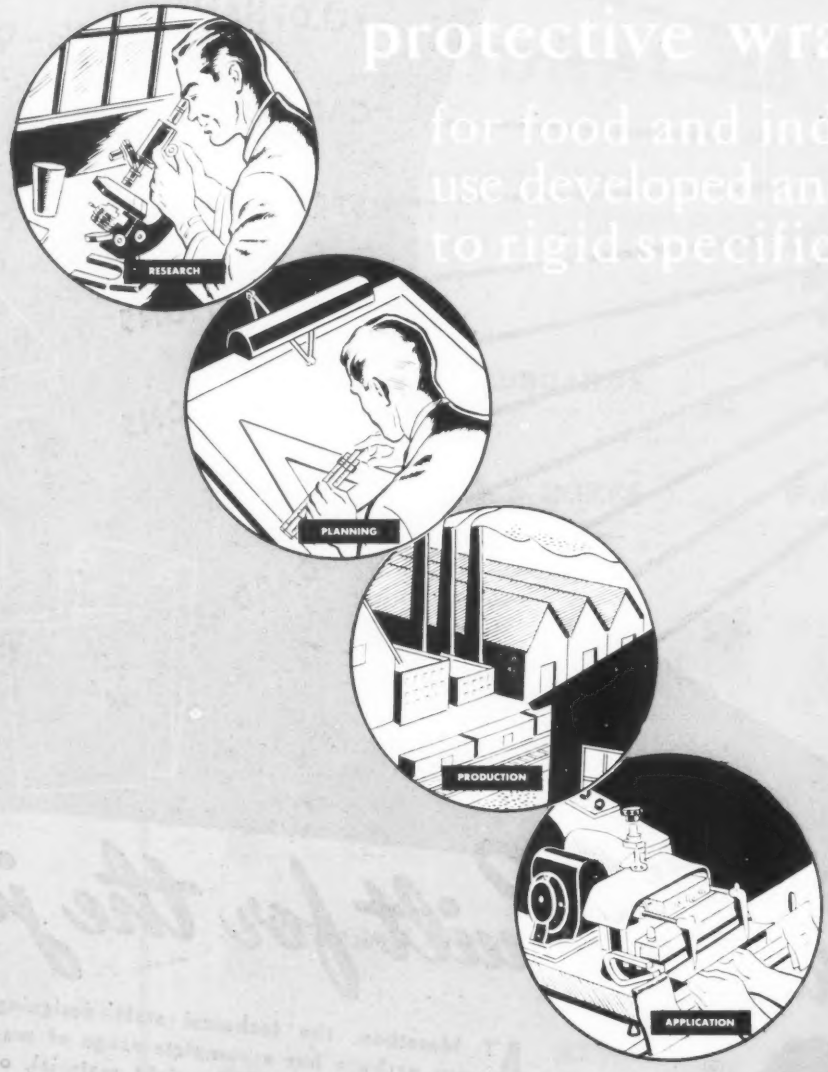


AT Marathon, the technical staff designing your package has a complete range of materials at its command. The right material, or materials, to meet requirements are selected. The package construction and design best suited to do the job are chosen. This diversification of Marathon engineering, production and converting facilities is responsible for the outstanding packaging results being accomplished by Marathon in the food industries. Your package inquiry will receive prompt attention.

MARATHON CORPORATION
MENASHA, WISCONSIN

MARATHON

protective wrappings
for food and industrial
use developed and made
to rigid specifications



BULKLEY, DUNTON & CO.
295 MADISON AVENUE, NEW YORK 17, N.Y.
SPECIALISTS IN PROTECTIVE WRAPPINGS

MACHINERY AND EQUIPMENT

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ENCYCLOPEDIA OF MODERN PACKAGING
1946-47

XUM

Mechanizing packaging operations

Since the lush days of "production at any cost" will soon give way to competitive production, now is the time for the packager to review his entire plant setup in order to determine whether or not each operation will stand up against criteria of efficiency.

In doing this, he must take into consideration both his present production and his anticipated volume. Too often, the packaging of a specific item has grown from small beginnings to an appreciable volume before careful study is given to each operation and to the machine with which it is performed. Even plants which are highly mechanized have, to cope with expanded demand, merely duplicated existing equipment before determining the real value of that equipment for the job at hand. Thus, previous errors have been perpetuated in the choice of new units, in combinations of units and in their physical arrangement in the plant.

The modus operandi will, of course, differ for each type of product and will depend upon volume of production, price bracket, the shape of the container and upon the unit pack.

If more than one product, or type of product, is packaged, the handling of each should be critically, but separately, reviewed. Usually, many possibilities for improvement will be found. Where reconversion from a substitute package to the traditional prewar type is contemplated, the opportunities for modernizing production line operations will be even greater. For long profit items, such as toiletries, the urge to increase efficiency and dress down packaging costs is not so great as it is with grocery or dime-store items.

To the many, and often complex, problems confronting the production man, must be added that of selling his program to his management group. This can, and should, be done on the basis of flexibility in production, reduction in operating personnel with attendant reduction in operational worries, better utilization of available floor space and improvement in the appearance of the product. Also, a well-conceived program may eliminate the necessity for larger quarters. If the position of the production man is sound, he should enlist the active support of the operating personnel and particularly that of the supervisory staff.

It is no mean job to gather the factual information necessary for a decision to replace manual operations by installing semiautomatic or fully automatic equipment. Everyone in every department must be tied in with the program and familiarized with its immediate and its long range aspects if wasteful errors are to be avoided. For example, the production department may put through a plan for mechanizing the packaging of a product only to find that the sales department plans to make a drastic change in the container. The sales department may even plan to withdraw that package altogether, and to concentrate upon another product which the production department is ill-equipped to handle in suddenly increased volume. In such cases, even though the potential labor and other savings may fully justify the new installation, the savings may not be realized, due to extraordinary circumstances.

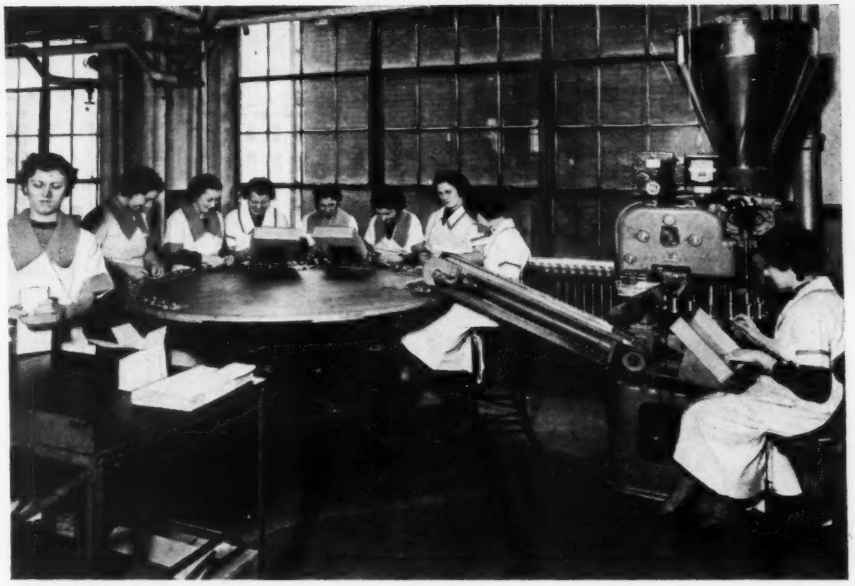
The production cycle

If only one product is being packaged, volume alone usually determines whether or not mechanization is economically sound. However, if two or more specialties are produced, complications creep in. The first vital point to determine is whether the two or more products should be produced simultaneously and continuously at the present tempo, or whether they should

PHOTO, COURTESY JEFFREY MANUFACTURING CO.



1—On fully automatic packaging lines such as this one, all equipment must be synchronized. Many of the components must be individually engineered and well planned.



2—For many plants and products, semiautomatic lines are best. Here collapsible tubes are filled by means of semiautomatic and hand operations.

PHOTO, COURTESY F. J. STOKES MACHINE CO.

be produced alternately (or in sequence) in a cycle at increased speed. If the machine capacity of the plant is in excess of that required for a single product, it can frequently, with the aid of a few attachments or a little auxiliary equipment, be utilized for more.

A typical cycle is that used by the vegetable canner. He employs the same line or lines to pack peas, then tomatoes, then corn in season; and he keeps his equipment moving and his organization intact by packing pumpkin, hominy, etc. in off seasons.

Similarly, the carbonated beverage bottler may also bottle a franchise beverage and other light drinks; the distiller bottles both gin and whisky; the shaving cream manufacturer makes lather and brushless types, and perhaps tooth paste as well; the gelatine dessert kitchen adds puddings and pie-fillers to its list; the baking powder compounder also compounds chocolate malted milk powder; and the face powder merchandiser formulates his product in five or six different shades.

Though the containers involved in the above examples include such diverse types as re-use and one-time bottles, collapsible tubes, envelopes in folding cartons, tin cans, fibre-body cans with metal ends and set-up boxes, the problems are substantially the same. Accordingly, we need but one discussion of the subject, since but one decision is necessary in each case, and that decision must be predicated upon fundamental principles of production.

If volume of production does not warrant mechanization of the packaging of each item, then the economics of installing one mechanized line for two or more products should be explored. Continuous production of a single item would then give way to intermittent assembly in a cycle.

Every packaging job is made up of three parts:

1. First, the make ready. At this initial stage, the equipment is set up or prepared, and the contents and packaging components are arranged.
2. Next, the "do," or actual packaging operation.
3. Finally, the clean-up, at which time the equipment is cleaned, left-over packaging components are put away, finished packages are stored.

So that the make-ready and the clean-up parts of the job may take as small a percentage of the total time as possible, the production cycle should be as long as is practical.

For example, take the case of the shaving cream manufacturer who makes lather, brushless creams and tooth paste. Assume that he uses 13 four-week production cycles per year and that total sales are in the approximate ratio of five tubes of shaving cream to three of brushless shave and two of tooth paste. Here the new packaging line should run for ten days, six days and four days, respectively, for each of the three products, and a four-week stock of each item should be produced.

This would present no major difficulties; one collapsible tube line has, for a period of years, successfully run four different food flavors, three food colors, three tooth pastes, both types of shaving cream, baby ointment, cold cream, white shoe dressing, neutral shoe cream, stain remover and bluing in a four-week production cycle. Rarely was it necessary to interrupt the production of one item and package another to replenish a depleted or exhausted inventory of the latter.

The distiller who produces both gin and whisky might install two fillers in one packaging line in order to eliminate the clean-up time and the possibility of the whisky tinting the gin or the gin scenting or flavoring the whisky.

The face powder merchandiser who packages his product in several shades can save on the clean-up time. This may be done by starting with the lightest shade and packaging each progressively darker shade in turn. Thus, a thorough clean-up will be needed only after each complete cycle of six shades.



3—The packaging of bacon at Swift's illustrates an operation demanding a minimum of mechanization.

Adapting package design to the production line

In designing a new package, it is well to consider its adoption only on a long-range basis. It may be possible to handle the initial volume manually, but if the package has half the success necessary to justify its enthusiastic and costly introduction, it will probably ultimately be produced on automatic equipment.

The producer's judgment should be backed up by that of the container supplier and the equipment manufacturer. The new design may be a beauty, loaded with sales appeal on the counter or shelf—but an abominable monstrosity on the production line. Yet a meeting of the minds in the matter of practicability may be accomplished by some minor changes which involve little, if any, sacrifice in desirable attributes.

If a substitute container is being replaced by the time-honored historical one, an ideal opportunity is offered for removing all of the former production "bugs" from the design. At the same time, the package may be made more practical and more attractive to the consumer. Likewise, in the case of a standardized bottle which is being reconverted to the bottler's individual private mold, the opportunity for making it flow more smoothly through the packaging equipment and of making it more acceptable should not be neglected.

If the old design does not lend itself to mechanization, a change may be warranted. Often, with the help of the container supplier and the equipment manufacturer, the container may be redesigned so as to be easily handled on the line and yet suffer little change in convenience or outward appearance. But one need not despair if this kind of redesign seems not to be feasible—there have been many cases where an utterly impossible container was changed in a series of easy stages to one which lent itself to mass production.

Often, cooperation among suppliers will solve knotty problems. In one case, five bottle manufacturers were supplying the same container. While reputedly identical, the bottles differed sufficiently in dimensions to necessitate trying production line adjustments with attendant loss of production time at each change from one supplier's product to another's. All suppliers were invited to a round-table discussion and, at the end, all agreed to work from a single set of drawings. The trouble was practically eliminated. Obviously, if the packaging operations had been performed by hand, the minor differences would mean nothing to the operators. However, where equipment is to operate at maximum efficiency, uniform containers must be supplied.

Considerations in mechanization

Our entire discussion may seem to have been directed to the small operator. However, in the packaging field there are twenty or more small producers to each large one. The large manufacturer, in addition to drawing upon the skill and experience of his own technical staff, may employ the services of consultants as the occasion arises. Then, too, when he contemplates further mechanization of his plant, his purchases of machinery and equipment are usually so large that the manufacturers of packaging materials and equipment vie with each other in making all possible data available to him.

In consumer durable goods, such as vacuum cleaners or automobiles, the cost of research and development is spread over thousands, or even millions, of units. Since the units are *manufactured* and not *built*, there are attendant savings and greater efficiency. In capital goods, such as packaging equipment, the cost of development, engineering and patterns must be absorbed by relatively few units. In the case of the materials-handling equipment, each job must be individually engineered.

In the last analysis, therefore, the purchaser of packaging equipment is not buying a given lot of bronze, brass, steel, cams and gears, but the brains of the manufacturer and of his engineering staff. High though the price of the equipment may appear, it is not an expense but an investment which will return dividends by saving time and improving products.

If the cost of completing a justified mechanization program is in excess of the available budget, the plan may be executed piecemeal. A time study may be made of hand operations and of operations performed on obsolete or semiautomatic equipment. The claimed production speeds of the various contemplated machines (perhaps discounted to allow for the time a machine is "down") may be reduced to cost figures and compared with those obtained from the time study.

When mechanization is to be piecemeal, whether because of budgetary considerations or because of unavailability of equipment, care must be taken that a plant layout shall anticipate the ultimate installation of all units (see p. 703). Thus old and new equipment will dovetail and will function as an entity.

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Fundamentals of packaging plant layout

To the manufacturer who wonders whether or not to move into more modern, convenient or larger quarters, the answer is: Don't—at least until a careful and thorough survey proves beyond doubt that the present quarters cannot, by careful planning and layout, be made wholly tenable. To the manufacturer trying to decide whether or not to rearrange the present production area and install additional equipment according to a well-conceived, well-matured, definite and comprehensive plan, the answer is invariably: Do—by all means proceed at once, for reduced costs, an increased output of neater, more salable products, and a more contented body of workpeople are the inevitable reward." These remarks, published by the writer more than twenty years ago, still hold, even though packaging in all its aspects has made great progress along an interesting and dignified, if rough, way.

The layout of the packaging department—also frequently called the "assembly" or "finishing" department—is our chief concern here. However, since the department layout cannot be divorced from the layout of the plant as a whole or from the choice between competitive units of equipment, these factors must also be given some consideration.

For each installation where the production man can start from scratch, lay out his equipment and then have an architect build the plant around the plan, fully a dozen must accept the existing structure as is. Structural changes must usually be kept to a minimum, regardless of the type of building. It is much easier to lay out a new packaging department than to revamp an old area, since the latter procedure involves changes in piping, power, light wiring, and the removal and addition of interior partitions. However, among the compensations when an old area is renovated are the opportunities for improving safety conditions. The result will be a lowered accident rate, lowered liability insurance costs and happier, more interested workers.

Since each installation presents its own problems, certain generalities have been outlined below. These are followed by mention of basic principles of arrangement for various types of packaging plants.

General considerations

Continuous line—The continuous-line principle, so well and firmly established in all packaging and assembly operations, should be extended to embrace every operation from the receipt of raw material and packaging supplies to the disposition of the finished products in the shipping department or on the loading platform. Regardless of the type of product produced, the whole operation may well be looked upon as one of materials handling. There are pauses of varying length in the receiving, processing and shipping departments, and momentary pauses at the filler, the capper and at other points on the assembly line. (See *Materials-handling Equipment*, p. 758.)

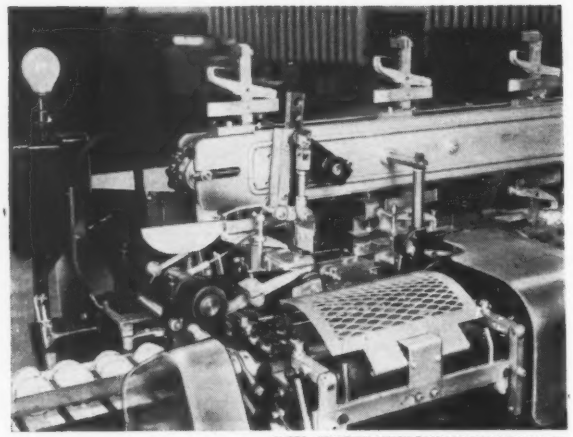
Handling returned goods and samples—Returned packaged goods are inevitable, but, too frequently,

PHOTO, COURTESY CONSOLIDATED PACKAGING MACHINERY CORP.



1—*In planning a plant, consideration should be given to looks, safety and noise reduction as well as to mechanical efficiency. Typical of a well-conceived, fully automatic, continuous-line layout is this arrangement in the Seagram plant in Louisville.*

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PHOTO, COURTESY LYNCH PACKAGE MACHINERY CORP.

2—Use of proper guards on machinery can help to avoid many accidents and consequent loss of time.

little or no provision is made for making prompt and efficient disposition of them. The handling of returned merchandise should be put on a factory basis which approaches that of the packaging lines in efficiency. Regardless of the type of container employed, a standard practice may be established. This is equally applicable to the handling of samples which should also be given proper consideration in every plant layout.

Discard of "light weights"—There is a growing tendency to make provision for throwing out "lightweight" individual containers and shipping cases. The reasons for this extra care vary. One reason may be consumer ill will engendered by slack fill of containers. Another is the discouragement of pilfering all along the line from the packaging plant through to the point of sale, especially in the case of such products as liquor or costly perfume.

Noise factors—As packaging equipment is speeded up, or as new and faster equipment is installed, increased noise may be expected. It is a recognized fact that noise is nerve-racking and that it contributes to fatigue. Several methods have been used to overcome it. For example, various pieces of equipment on fully automatic packaging lines are often synchronized for quieter operation. Also, more quiet operation has been achieved in some cases when straight line equipment, which handles containers in gangs is replaced by rotary equipment which handles them singly and continuously rather than intermittently. Among devices used for eliminating noise are sound-deadening ceilings, rubber-tile floors, vibration dampeners installed under the packaging equipment and double glass interior partitions which segregate particularly noisy equipment.

Variable speed drives—Variable speed drives are almost indispensable, even on conveyor work tables on which hand operations are performed. In the latter application, the objective is to slow up the lineal travel of the conveyor belt to the practical minimum. When this is done, useful work is performed more rapidly. Variable drives adjust the speed either up or down.

Electrical considerations—Every piece of equipment should be properly grounded to eliminate the effect of static electricity which can result in diverse nuisances. It may cause adherence of impalpable powder to the discharge hopper or spout of a dry filler or it may result in peculiar behavior of labels on a labeler. As for the power wiring and the intensity of light in various areas, these may preferably be left to the electrical contractor.

Change-overs—If a packaging line is to handle containers of varied size and shape, the speed and ease with which change-overs can be effected should be considered when selecting between competing equipment.

When a product is packaged, small units must be made from large ones. The moment the small units come into being, the costs of handling mount. Therefore, the breaking up of the large units should be deferred as long as possible in the packaging operation. This principle is equally applicable to the packaging of liquids, pastes, creams and solids. Inspection stations should be provided so that samples can be removed, inspected and returned with minimum disturbance to the production lines and to the operators.

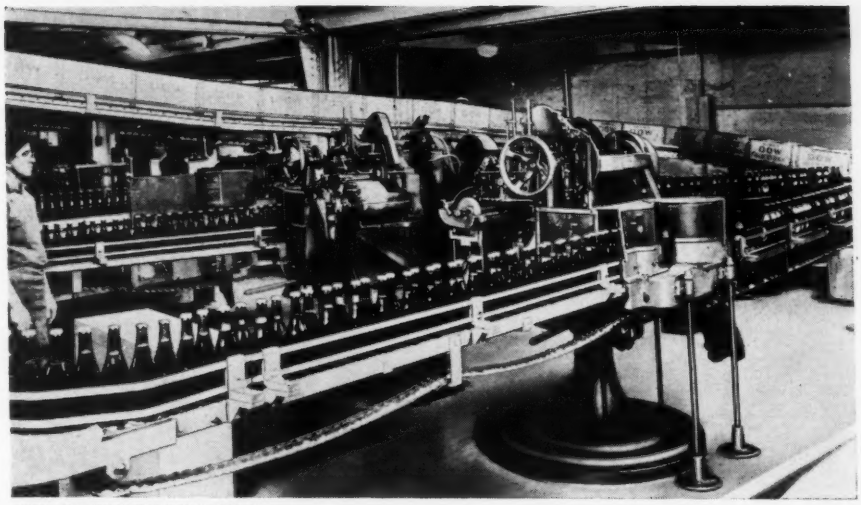
Gadgets—Every package assembly department has its quota of gadgets, devices which are the handiwork of mechanics or of the workers themselves. They may range from simple carton deflectors, light reflectors and door stops to container guides, holders and rests. A few have merit, others are less good, some are valueless, if not dangerous. Each such makeshift should be carefully evaluated and those having value should be adopted and put on a workmanlike basis. Those showing promise should be developed until they are practical and should be utilized in the new layout.

Gadgets may also improve the operation of a new machine. It is usually assumed that a new, modern piece of equipment is complete. However, for the given application, gadgets often can be applied to add to the comfort of the operator or to the speed or efficiency of the machine. A sponge-rubber arm rest mounted on a spring, an extra start-stop button or two, a mirror or a flexible arm light mounted just so, are typical of such devices.

Orderliness—Nothing contributes more to the disorderly, untidy appearance of the premises than neglect to make proper provision for waste. If the building has more than one story, a fireproof chute having outlets at convenient levels on each floor, and enlarged at the ground floor for baling and removal, has been found helpful. A hole cut in a wrapping table over a concealed receptacle rids the area of scraps. If all wrappings from labels, spoiled labels, individual cartons, wrappers from employees' candy bars and chewing gum, and other debris are put on the conveyor and discharged into a built-in receptacle at the end, the necessity for receptacles along the line is eliminated.

Some equipment can be fitted with skirts which hide much unsightliness and at the same time provide space for the concealed waste containers. Standard corrugated cans mounted on casters and concealed under

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PHOTO, COURTESY ECONOMIC MACHINERY CO.

3—Here a rotary labeler is part of the production line in a brewery. Any layout, whether I-shaped, U-shaped or L-shaped, conforms to the straight-line principle where there is a continuous flow of packages from one operation to the next. Note the overhead conveyor used for the cases.

neatly painted or stainless steel sleeves, are excellent for cullet. The openings in the tops of all waste containers should be as small as practical so that waste must be dropped in them, rather than thrown at them. These will suggest many possibilities—all of which will be found helpful in forming orderly employee habits.

Layout of equipment

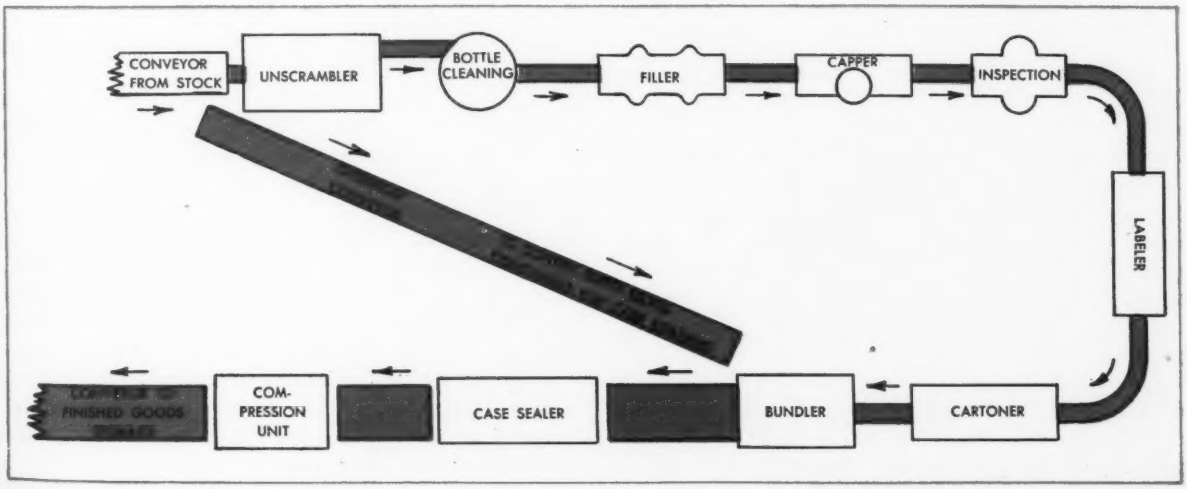
If it is at all possible, a flow sheet of the entire packaging operation, from the receipt of raw materials and findings to the shipment of the finished packages, should be made when the line layout is planned. Cardboard templates, made to scale and properly labeled, should represent each piece of equipment on an accurate scale drawing of the available area. If the installation is to be made in a building having more than one story, an isometric chart should be drawn to show each floor in its exact relationship to all other floors. This will make it possible for those responsible for the flow of the work to visualize the routing more readily.

Even better is the scheme of making scale models of all equipment, from unscramblers to case sealers and discharge conveyors. A plywood model of each floor, complete with columns, openings, elevators and partitions, should be made to the same scale as the equipment models. Planning in three dimensions instead of in two will minimize errors of omission and commission when it comes to the actual installation.

When considering line production, many think that a literally straight line is dictated. But the space may often be used more efficiently if the line is in the shape of an "L," "U" or even a "Z." Actually, when the line is straight, that is, I-shaped, it bisects the production area and, particularly when the number of hand operations make for a long line, it requires much footwork. This factor can be relieved to a degree by stiles which are good practice for such equipment as labelers which affix front and back labels simultaneously. However, they are never popular with women workers.

If the area is a loft building served by one elevator or by a single bank of elevators, the U-shaped line can

4—In the case of this typical continuous line for filling liquids, a U-shape saves valuable floor space.



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PHOTO, COURTESY LAMSON CORP

5—Proper materials-handling equipment is important in the layout of this plant where biscuits are packaged. Here the cartons have passed the filling belt before reaching the checking and closing machine. At the junction of the overhead belts there are chutes and diverters for the delivery of biscuits to belts feeding other filling stations.

be so arranged that both receiving and shipping are near to the elevators. An L-shape suggests itself where receiving is at the end of the building and shipping is at the side, or vice versa. In any case, consideration should be given to future requirements. Provision should be made for future installation of faster line equipment, changes in container styles, changes from bulk packing to reshippers, use of Christmas or seasonal cartons. Provision should also be made for expansion and additions without loss of integration.

As far as materials handling is concerned, no one type of equipment will serve all purposes, and it is folly to attempt to make it do so. A given layout may require everything from wheel trucks and lift trucks to gravity, portable, live roller and belt conveyors, and monorails, articulated fork trucks and pallets may also be needed.

All of the foregoing comments are equally applicable whether the production lines be hand operated at 25–30 containers per min., semiautomatic at 45–60, or fully automatic at 80–120 containers per minute.

Filling liquids

So far as line layout is concerned, it matters little whether the product be flavoring extract, liquor, deodorant, tonic or household ammonia, since all are water-thin or free flowing. It is obvious that corrosive action or adverse effect of certain metals on the product must be considered and also the effect of the product on the metal. In this connection, no information should be withheld from the equipment manufacturer. The formula need not be divulged, but only if he receives full cooperation can the manufacturer be expected to guarantee performance.

As viscosity becomes a factor, as it does in the case of lotions, household or lubricating oils, etc., only the filler is affected. Likewise, provision for spills will vary depending upon the value of the product in bulk, the viscosity, need for, or practicability of, salvage.

The layout for a fully automatic liquid line is: conveyor to feed the line → unscrambler → container cleaner → filler → capper or corker → inspection booth or magnifier → labeler → transfer conveyor → finishing belt conveyor → cartoner → bundler → shipping case sealer → compression unit → discharge conveyor to finished goods storage. If reshippers are employed, then an overhead conveyor belt is needed from the unscrambler to the discharge end of the bundler.

Possible variations are innumerable, both as to product and as to the thoroughness of mechanization. For example, a dump table may be needed for an unscrambler, a hand tool for a capper, a rubber mallet for a corker, a label board or label gummer for a labeler, or a brush and glue bucket for a case sealer.

Filling creams and pastes

The line layout for creams and ointments must be determined by whether the product is to be filled hot or cold and whether it is to be filled in cans or jars or in collapsible tubes. The flow of a fully automatic line for a product filled hot in cans or jars is: conveyor to feed the line → unscrambler → filler → "to-fro" cooling table → capper → labeler → transfer conveyor → finishing belt → cartoner → packing station or bundler → shipping case sealer → compression unit → discharge conveyor to finished goods storage.

Variations similar to those outlined for packaging liquids are applicable here. In addition, since a can will dissipate heat faster than a jar, a shorter cooling table or one with fewer "to-fro" belts, is required. Equally obvious is the fact that the lower the filling temperature, the shorter the "to-fro" belt table required. If no "to-fro" table is provided and cooling is accomplished on a table or bench top, the operation must of necessity be on a batch (fill, cool, close, repeat) basis rather than continuous.

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For filling at room temperature, no cooling table is required, of course, but the filler must of necessity be of an altogether different type. (See *Filling Pastes and Creams*, p. 720.) Filling in collapsible tubes eliminates everything from the unscrambler to the finishing belt, since available equipment takes the empty tube, cleans, fills and closes it and discharges it ready for insertion into the individual carton. (See *Tube Filling, Closing and Sealing*, p. 726.)

Filling solids

The choice of fillers for solids depends upon whether the product is an impalpable powder such as a face powder or pudding powder, or is free flowing, like bath crystals, toilet bowl cleaner or gelatin dessert. Also, the type of container affects the choice of equipment: equipment for filling cartons differs from equipment for filling cans whether the cans have metal or fibre bodies.

A can or bottle which is round will require a "roll through" labeler whereas a flat one will require a labeler designed to have the containers pass through in a vertical position.

Again, a lithographed can or a bottle with a preapplied or applied color label, requires no labeler at all. The same is true for a printed carton.

A full-automatic line for solids packaged in bottles or cans comprises: conveyor to feed the line → unscrambler → cleaner → filler → capper → labeler → transfer conveyor → finishing belt → cartoner → packing station or bundler → shipping case sealer → discharge conveyor to finished goods storage.

Again, the variations listed for the liquid-filling line apply, and it is immediately apparent that various other changes are required. For example, if an envelope is formed within the carton, the material is filled directly into the carton, and a tight-wrap or transparent wrapper is applied to the exterior.

Miscellaneous considerations

Innumerable additional suggestions could be made for various layouts. No mention has been made of such diverse subjects as painting and color schemes, of air conditioning, or of the use of the electric eye for rotating bottles to spot the labels on label panels or to count incoming or outgoing cases. However, at best they could but be suggestive, and as one undertakes any given layout job it is remarkable how apparent the need for consideration of every phase becomes.

Now a few words about the choice of the machine units themselves. Designers have given intensive study to increased speeds, adjustments for size changes, easy accessibility for repairs and minor adjustments, lubrication and cleaning, variable speeds and ready replenishment of labels and other material supplies.

When the new layout is completed, management will throw out its chest and hang out the "visitors welcome" sign. Thus, the production man must look not only for capacity, ease of size changes and troubleproof operation, but also for good looks, safety and noise reduction or elimination. The chromium plate, the expanded metal guard and the fibre pinions may well be included in the streamlining.

The production man's job is among the most thankless in the organization. He is apt to think that his desk is mighty far from the front office—that his voice is seldom heard in the management deliberations and conferences. This is lamentable but often, in part at least, of his own making. With various scares, he may ward off changes and improvements, whether in plant layout or in new packages. He may dwell at length upon the trouble, expense and production interruptions involved. Let him try reversing his position. He is going to come out second best anyway—changes and improvements in plant and processes will not be stayed by his feeble voice. They are vital to progress and they are inevitable.

PHOTO, COURTESY STOKES & SMITH CO.



6—The layout of new equipment must frequently be influenced by the architecture of an existing plant. Often, too, it is best to combine hand and automatic operations. Here cartons are filled and sealed by fully automatic equipment and cases are packed by hand.

Weighing and filling dry products

Because of more rigid standards promulgated by the Food and Drug Administration (see p. 99), the accurate weighing and filling of dry products is increasingly important to packagers. Difficulties of achieving accurate weighing and uniform filling are augmented by a tendency which has been indicated in numerous administrative actions: package sizes are restricted to dimensions which are far closer to the volume occupied by the contents than the sizes formerly demanded. Such restrictions may reduce the orifice through which a package is filled, may make settling of the material by mechanical jiggling more difficult, and in other ways complicate the physical problem of handling materials. However, automatic machinery seems fully capable of coping with these added difficulties.

In general, dry materials may be divided into two classes: free-flowing and non-free-flowing materials. The free-flowing materials are suitable for net and gross weights, while those which are not free-flowing must be handled by other methods.

Maintaining uniformity of bulk

Uniformity of bulk, so important for the volume filling methods, is equally important when the other methods are used.

In any product containing sugar, from cake mix to chocolate malted milk powder, a mixture of sugars may be used. Pulverized sugar runs as high as 29 fl. oz. per lb.; powdered sugar, 19–20; and granulated sugar, slightly over 16. It follows, then, that it is an easy matter to adjust the apparent density up or down to compensate for the normal variation in the other ingredients by adjusting the ratio of the sugars from batch to batch.

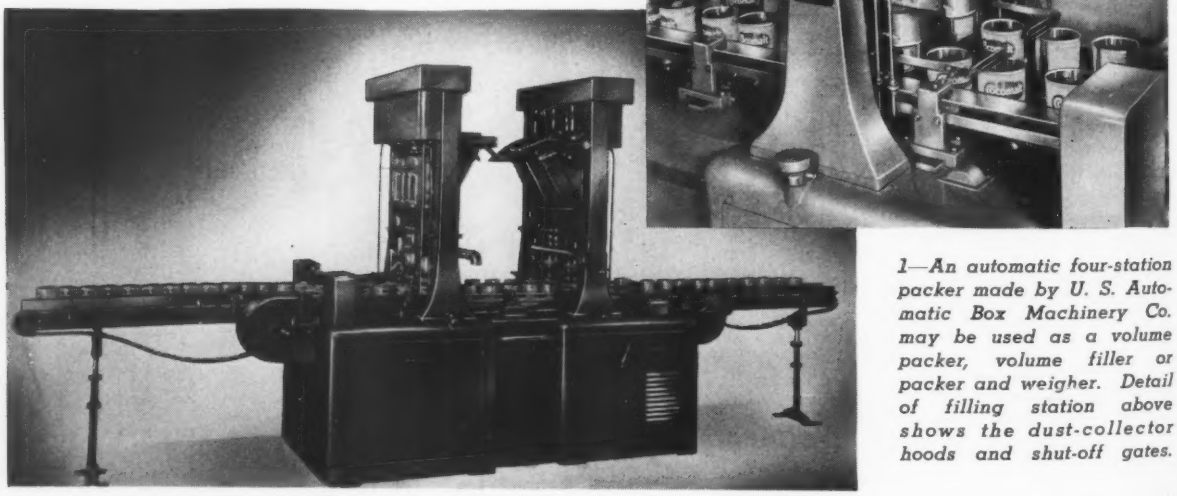
Precipitated chalk is available in a number of apparent densities. If a suitable light chalk and a heavy one are always in stock, ratio adjustments can be made if the finished product tends to become too fluffy or too dense. This holds whether the finished product be face powder, tooth powder or any other product in which this ingredient finds application. Any product containing soda ash, from scouring powder to dish washing compound, can be prepared as readily by adjusting the ratio of dense to fluffy ash.

In any case, the finished mix should be checked for apparent density before delivery to the filling machine. In rare cases, where adjustment causes difficulty in the filler, a subsequent batch can be adjusted to compensate for the one which preceded it, and the two can be mixed before discharge from the mixer for filling.

Volume filling without weighing

The simplest filling methods are those in which the desired quantities of the product are measured mechanically without the use of a weighing device. One way of accomplishing this is to measure by volume. Another is to use a definitely timed or regulated feeding of the material.

As long as the bulk, that is, the apparent density, remains uniform, good commercial accuracies can be maintained on correctly built machines of this type. If, however, the nature of the product is such that it varies in weight per unit of volume (apparent density), then measuring by this method may not be sufficiently accurate for commercial requirements.



1—An automatic four-station packer made by U. S. Automatic Box Machinery Co. may be used as a volume packer, volume filler or packer and weigher. Detail of filling station above shows the dust-collector hoods and shut-off gates.

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2—At John Middleton's, unit by Wright's Automatic Machinery Co. has lid transfer and feeding device.



3—Here powdered milk is packaged on a single-unit filler of the auger type by Stokes & Smith Co.

Many machine units are capable of handling packages of various sizes at speeds of 10–120 per minute. The simplest type comprises a hopper, a feed auger and a hand- or foot-elevated filling table upon which the container rests. Raising the container and table starts the packing fill, and the flow is cut off as the container is filled and is forced from the filling tube.

A positive clutch and braking mechanism ensures a quick cut-off, absence of dribble and consequent irregularity of fill and dust.

In point of capacity, the next machines are the semiautomatics which have capacities of 20–30 containers per minute. An operator is required to put on and take off the containers. The auger type of mechanism does the filling. When cans are filled, the tops are put lightly in place by hand then are pressed home by an attachment on the machine. One modification of this type completes the fill in two steps: first, the container is partially filled while the air is allowed to escape; next, the container is air sealed while the fill is completed, thus minimizing any dusting tendency.

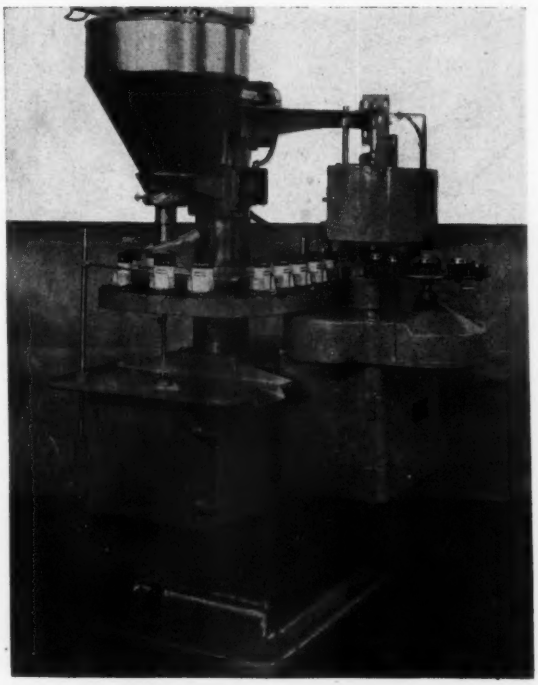
The fully automatic machine operates on the same principle, but moves the containers under the filling auger and passes them automatically. The containers may be moved along in a straight line or in a circle. They may be discharged onto a conveyor after filling and closing operations.

Gross-weight weighing

Gross-weight weighing involves the use of scales which weigh the package and its contents rather than the product alone. For accuracy by this method, therefore, there must be a relatively high degree of uniformity in the weight of the empty packages. This may be achieved through the inherent nature of the package selected, or it may be accomplished through the use of a package-sorting scale.

The flow of materials from the feed-hopper to the package is controlled by a scale beam, on one end of which the package rests during filling. Thus, when the right amount of material is dropped into the pack-

4—Automatic filler and capper by F. J. Stokes Machinery Co. has lid transfer and feeding device.



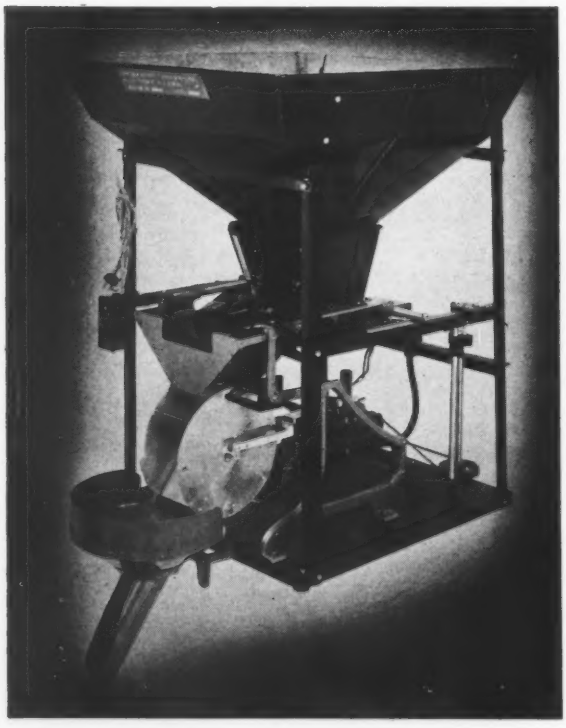
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5—This new type of scale by Wright's Automatic Machinery Co. operates on the principle of hydroelectric displacement. The weight is predetermined.

age, the scale beam trips a shut-off which stops the flow of the material instantly. The package is then moved to the next position. To speed up production, particularly on larger package sizes, two-scale machines are frequently utilized. A bulk load, amounting to $^{2}/_{3}$ to $^{9}/_{10}$ of the total quantity, is filled on the first scale. The final load, weighed to extreme accuracy, is then delivered to the second scale. Speed ranges are 10–70 units per minute.

6—Hopper-fed unit by Amsco Packaging Machinery Co. for filling and net-weighing free-flowing products.





7—Electrical precision unit by Exact Weight Scale Co., used to weigh drugs at First Texas Chemical Co.

Combination method

A combination of gross weighing and volume filling (i.e., measuring) is sometimes used to achieve maximum speed and high accuracy.

A typical field of application for this combination method is in the packing of flour bags. Since it is necessary to achieve a tightly packed bag, straight gross weighing becomes impractical. By resorting to a worm packer for the machine's first station, the greater part of the bag's contents can be packed in tightly, at a reasonable speed, without a special weighing operation.

To achieve weight accuracy, filling is finished off at one or two subsequent stations by directing a fine stream of the flour into the container while it is resting upon a platform scale.

Net-weight weighing

Net-weight weighing is a system in which the package contents are weighed separately before being transferred to the package. A first essential for this type of weighing is that the product be free-flowing or at least semi-free-flowing. Obviously, this system cannot be utilized if the material is sticky.

On net-weight filling machines, the hopper feeds into a bin arranged on a scale platform. When the bin has received the predetermined weight, shut-off action occurs and the contents of the bin are dumped or otherwise transferred to the package. Net-weight weighing is utilized for such products as coffee, salt, tea, etc. The speed ranges for this type of equipment are 10–100 containers per minute.

Container types

A wide range of container types is utilized for dry products, including folding cartons, set-up boxes, all-fibre canisters, fibre cans with metal ends, metal cans, glass bottles and jars, etc. Certain basic considerations, however, affect the design of all of these if they are to be successfully and economically filled on standard types of machinery. Thus, for instance, containers with narrow-neck openings, which might be suitable

for liquid filling, cannot be successfully used for packing powders.

A prime consideration in the selection of any container for powder filling involves the choice of a package with a suitably wide opening for filling. Users of fibre-bodied canisters or metal cans sometimes solve this problem by filling through the open bottom end of the container and then seaming the bottom. The limit of auger diameter may, in this way, be substantially increased.

The folding carton and many of the paper bags currently used are well suited for packaging many dry products. Entirely acceptable styles of each of these basic types of container are available. The container should be carefully checked to determine accurately the adaptability of the product to the particular container selected. Such adaptability will concern protection, convenience and sales appeal.

Among the cartons, the tight-wrap and the sealed-end type with extended flaps are extremely popular for products which are apt to sift. Bags also enjoy wide usage in this familar field, and improved standards in construction and design now assure them consideration whenever practicable.

Pouring spouts, commonly used for such products as salt, sugar and soda, are automatically formed, shaped and inserted into cartons by a newly developed machine. The material for the spout is ribbon-fed and is placed into a shuttle which clinches it to the carton at speeds as high as 110 per minute.

Filling operations

With folding cartons, there are certain basic operations to consider. For some carton packages, all of the following steps will be needed, while for others, only a few are necessary.

1. Carton feeding and forming
2. Bottom sealing
3. Lining
4. Filling and weighing
5. Carton closing
6. Wrapping

For filling paper bags, current practice is to use automatic operations comparable to those available for use with cartons. The extent to which these mechanical approaches are utilized is optional. A typical automatic paper bag line would provide standard types of equipment available for the mechanical performance of the operations listed below.

1. Feeding, opening and registering bags
2. Weighing contents and filling bags
3. Settling and sealing bags
4. Nesting and packing bags in shipping containers

These functions are handled by correlated equipment designed with a view toward making progressive steps from minimum to full mechanization a completely practical process.

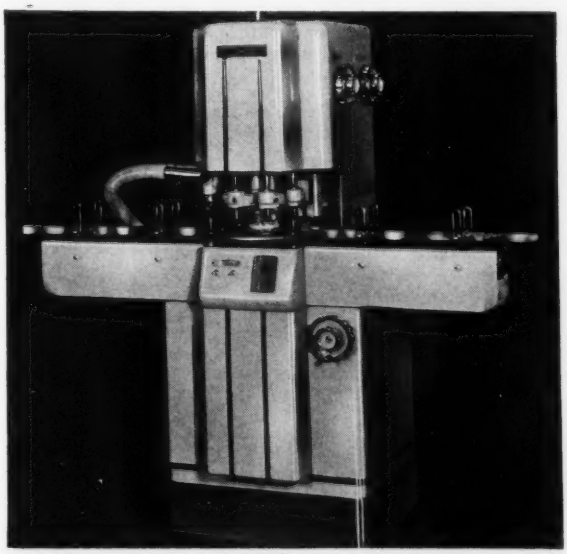


PHOTO, COURTESY SUPERIOR FERTILIZER CO

8—Large bags of fertilizer are packed by Exact Weight Scale Co. equipment at rates of 6–9 per min.



9—This Triangle Package Machinery Co. equipment is employed to weigh and fill potato chips in 8-oz. and 1-lb. bags. Shakes bags during filling.



10—Automatic cotton-wadding unit by Consolidated Packaging Machinery Corp. has a capacity of 100 per minute. Easily adjustable for quick change-overs.

Check-weighing scales and devices

Accuracy of container fill is a very essential factor in the packaging operation, and is covered in laws relating to the packaging field. (See *Governmental Regulation of Packaging*, p. 99.) Devices for determining accuracy of fill usually operate either by weighing or by measuring height of fill.

In the selection of a scale, it is essential to determine which of a variety of available types is best suited to the weighing job at hand. For example, a scale built with sufficient sensitivity for weighing 10-lb. packages would not have the sensitivity necessary in the case of 1-oz. or 3-oz. packages.

The packager must not only be careful to select a scale of the correct capacity—it is equally important that he choose a scale which has been designed to operate under the working and atmospheric conditions of the plant in which it is to be placed.

The operation of packaging and check-weighing scales should be automatic so that it is easy for operators to determine when the correct weight is reached. Many scales offer a wide indicator travel per ounce, which means that the weight tolerance of the package can be kept down to a mere fraction of an ounce.

Check-weighing scales

When packages are filled by hand, each one must be weighed. Weighing of each unit is unnecessary if automatic weighing fillers are used. However, even these are subject to occasional variations, and it is therefore customary to check continuing accuracy of fill by weighing every tenth or hundredth package, depending upon the nature of the product.

For small packages—For check-weighing small packages ranging from fractions of an ounce to 100 lb., the balance type of scale is most commonly used. The development of an over- and underweight indicator has adapted the balance scale especially well for the production and check-weighing of packages up to 100 pounds. This type of scale can be built with a high degree of sensitivity, is not seriously affected by machinery vibration and weighs correctly in any normal out-of-level position. The scale is simple in structure, requires little service and simplifies the process of weighing.

A number of over- and underweight balances have been designed and constructed to take care of various packaged items and to accommodate a variety of types of packaging assembly. In all of these balances, the scale dial shows the zero reading, which indicates the exact weight point. The dial may also be provided with weight graduations or tolerance marks.

Where weight graduations are employed, the operator or inspector is able to determine the amount of weight error in the package. This can be used as a guide in adjusting the filling equipment. If the scale is used for checking different commodities, the dial may be equipped with adjustable mechanical tolerance markers.

For large packages—For the check-weighing of large packages, some type of beam scale or a dial scale is generally used. Over- and underweight indicators have been very helpful in adapting beam scales to packaging needs.

1—A Toledo assures accurate weight in the packing of processed foods at the plant of the Fleming Co.



Automatic weight-sorting equipment

In some cases it is desirable to employ automatic equipment to sort packages by weight.

One type which has been widely used is set into the conveyor line so that the packages are passed over a weighing pan. Each package is momentarily lifted from the conveyor chains for weighing. On the opposite end of the scale beam, a pan carries a standard-weight container against which each successively produced package is tested. Containers which balance or over-balance continue along the line, while those containers which are of insufficient weight are automatically shoved off.

Another type of sorting scale is used to weigh packages prior to filling. Use of this method to supplement weighing filled containers permits accurate judgment of net weight of contents.

One company has developed an electronic method of

XUM

accurately classifying articles by weight during manufacture or packaging. The unit requires no synchronizing with the feeding conveyor, uses neither photocells nor mercury switches, and operates at unprecedented speed and accuracy. Compact, single-unit design facilitates ease of installation. The operation of this method is unique in that weights are taken at their dynamic value, thus eliminating the mechanics normally required to place the commodity on the scale, release the weighing mechanism and again put the commodity into motion. Packages or articles to be weighed are passed without interruption over the sensitive weighing unit and are automatically diverted into conveyor channels which are arranged to correspond to their weight classification.

Which of these weight sorters is used in a given case depends largely upon the value of the product. The material-labor ratio of many commodities makes it uneconomical to trim after packaging, and in such cases the weight-sorting equipment rejects only the underweight packages. More costly commodities packaged volumetrically warrant hand-trimming of overweight packages, and are usually sorted into three groups: underweight packages, packages of the correct weight, and those which are overweight.

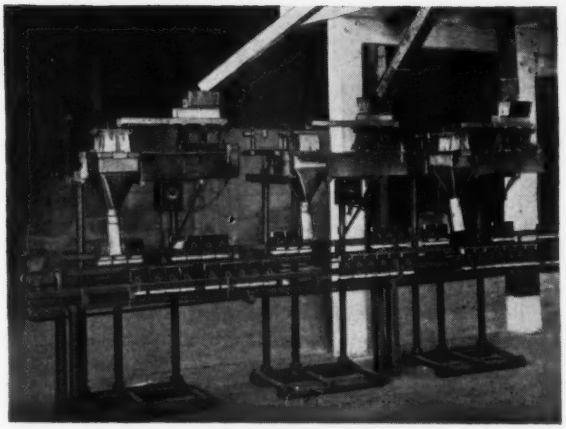
Volume outage detectors

Perhaps the simplest checking devices—in principle, if not necessarily in construction—are the so-called outage detectors which are used to determine the level of fill of dry-product cartons. Various types, straight-line and rotary, are available, all of them using the principle of a mechanical finger which is inserted into each package. In case the finger is able to descend further into the body of the package than a correct fill would permit, a mechanism is set in motion which throws the package off the line. Straight-line detectors are located at the delivery end of high-speed weighing machines and check packages as they leave these units. One type stops the weighing machine automatically if a package passes through which is not filled to the correct height.

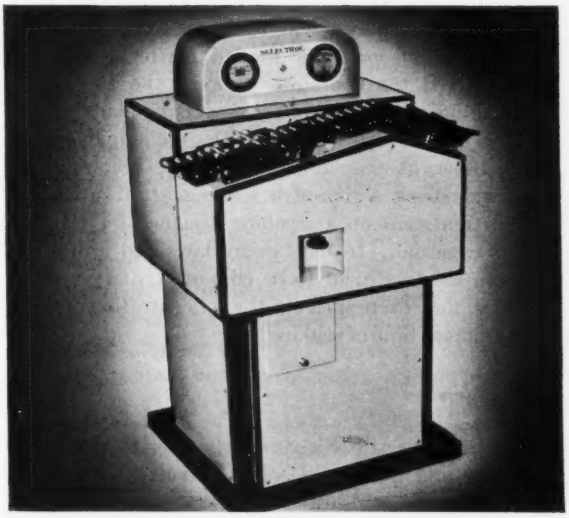
Another type utilizes a circular disk with vertically hanging members above the packages on the conveyor line. If the material is below the desired height in the container, contact is not made with the hanging member and a throw-out switch pushes the package off the line.

Check-weighing of outer containers

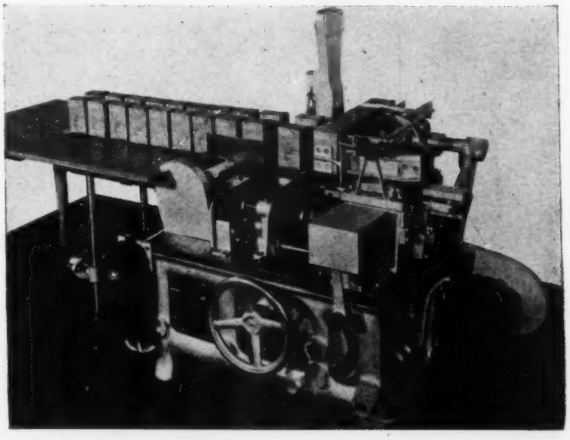
Check-weighing is frequently extended to include weighing of bundles and cartons containing 6, 12 and 24 individual packages, and also to include a "last look" at the sealed shipping cases. A refinement is a device which prints the weight on a ticket to be affixed to the shipping case. This discourages pilfering, but even if theft should occur in transit, it absolves the shipper from responsibility.



2—Bank of Weigh Right scales equipped with double vibrators. Each scale has capacity of 30 per minute.



3—Precision scale by Exact Weight Scale Co. automatically separates articles into groups by weight.



4—Automatic check-weigher by Arenco rejects over- and underweight units, handles a range of packages.

Bottle-cleaning equipment

Cleanliness of glass containers is of great importance for all bottling operations. In the case of amber, green and opal ware, prevention of contamination and compliance with food and health regulations provide reasons enough for thorough cleanliness. In the case of flint ware, the psychological aspect is added reason for care, since the smallest glass fragment, bit of carton lint or other foreign matter is immediately apparent.

In general, the available equipment for cleaning glass containers falls into three categories: rinsing machines, air cleaners, and machines which soak, wash and rinse the ware. Rinsing machines and air cleaners find application only for the thorough cleaning of new glass which does not require sterilization at the point of filling. These machines will remove any dust, carton lint, glass chips or other foreign matter which may have entered the container between the time of its manufacture and its use in the packaging plant.

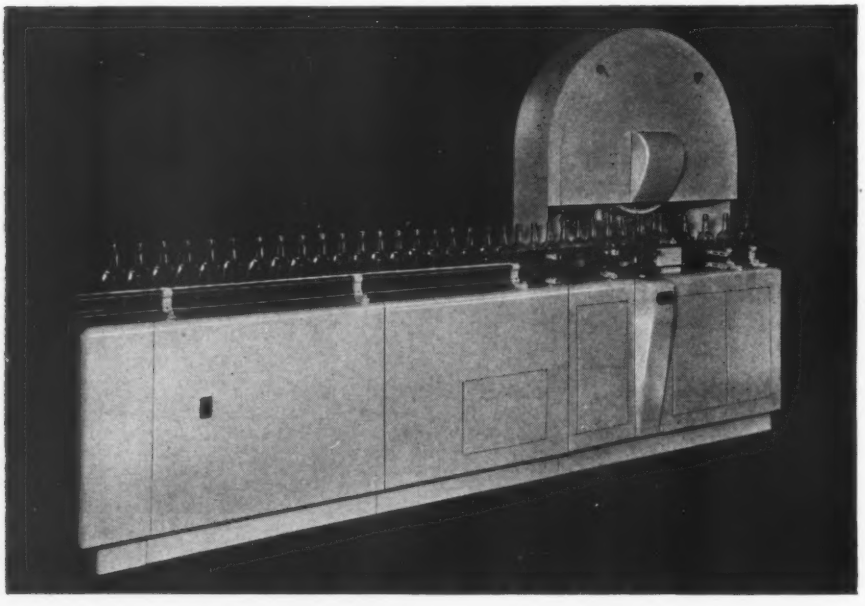
When secondhand ware or bottles are employed on a re-use basis, as they are in the milk, beer and soft drink industries, a thorough soaking, sterilization and rinsing treatment on a machine designed for the purpose is essential. In fact, many laws and ordinances set forth the treatment to be employed, and, in many localities, they even spell out the concentration of alkali and minimum time of soaking.

Bottle rinsers

Bottle rinsers utilize a spray of water to rinse both the inside and the outside of the inverted containers. The water may be heated, and it may include sterilizing solutions. Some of the rotary table types of rinser have a large number of spouts set in upright position on a rotary table. The operators invert bottles over these spouts. Next, the bottles pass under a hood where interior and exterior sprays are applied. Finally, they are removed to trays or a conveyor for filling. Machines essentially similar in principle use a straight-line conveyor or a chain conveyor designed to carry one or more rows of bottles through a rinsing hood where both interior and exterior rinsing are performed. If the water is hard and the exterior of the container is allowed to air-dry, the hardness of the water may leave a residue. This is of no importance for most products, but it may be a factor in the case of many toiletries.

For economy of water, of steam and of sterilizing solutions, the machine should not operate more quickly than the operators can apply and remove the containers at every stem. Particularly where lightweight ware is used, it is often advantageous to place a piece of soft rubber or a light spiral spring at the base of each stem to reduce the shock of feeding the machine. This type is suitable for hygroscopic dry products and emulsions adversely affected by the remaining moisture only if provision is made for subsequent drying by passing through an oven or any other device suitable for removing moisture.

In a modified machine, the containers are rinsed inside with the liquid they are to contain. It is of the familiar rotary table type, hand operated instead of motor driven, so that no nozzles are allowed to discharge a jet of washing liquid unless containers are



1—On this rotary air cleaner by Pneumatic Scale Corp., bottles up to 1 qt. in size may be cleaned at speeds as high as 120 per minute. The containers are inverted, subjected to an air blast and then delivered evenly spaced, onto conveyor.



2—Bottles are rinsed, washed and dried with this equipment built by U. S. Bottlers Machinery Co. Trays at right permit the use of this unit for a range of container sizes.

over them. Thus, the waste of liquid is confined to normal evaporative loss, since none gets on the outside of the containers. The liquid circulates by pump through a self-contained filter so that it is kept clean. This machine is suitable for free-flowing liquids which are relatively inexpensive. It should be used for those containers which are rinsed after filling and sealing or for those containers which are hand-polished before they are packed.

Air cleaning

Quite generally, rinsing is giving way to air cleaning. This is logical and ordinarily justified, for incoming new glass containers are received in a clean condition, save for cinders, dust, chipped glass and bits of carton lint that may get into them in transit and handling. Both hand-operated and automatic air cleaners are available in various models utilizing vacuum or compressed air or both. In addition, certain filling machines are equipped with an air cleaner built in as an integral part of the filler.

When working with the nonautomatic type, the operator places two bottles at a time against air tubes, arranged to provide a blast of air whenever the pressure of the bottle necks is applied. From 60 to 80 lb. of compressed air pressure are used and dirt, lint and other matter are thus blown out of the bottle. Such machines can be operated at speeds of 30–40 containers per min., depending mainly upon the skill of the operator and upon the size of the container.

Automatic machines of various types are also available. In some cases, rotary machines very similar to bottle-filling machines are employed, receiving the bottles directly from a conveyor and cleaning them while in upright position. They are discharged, one by one, back onto the conveyor, by means of a star wheel.

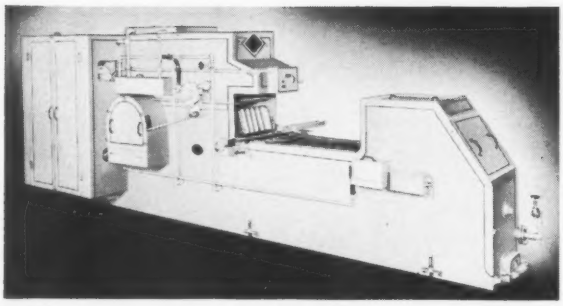
Another type of machine receives a group of bottles from conveyors onto a barrel-like holding device and then proceeds to invert the bottles over air nozzles. Cleaning is thus accomplished while the bottles are held in inverted position. While one set of bottles is being cleaned, the preceding set, at the opposite side of the drum, is being returned to the conveyor and a third set of bottles is being received, immediately thereafter, by the drum.

In the case of one adaptation of the rotary cleaner, each container to be cleaned is held rigidly at top and bottom and whipped into inverted position. The air pressure forces the air nozzle up into the neck and it drops back out as the air valve closes. Then the holder and container swing back into upright position

3—Semiautomatic air cleaner by Pneumatic Scale Corp. Operator inverts the bottles over the nozzles.



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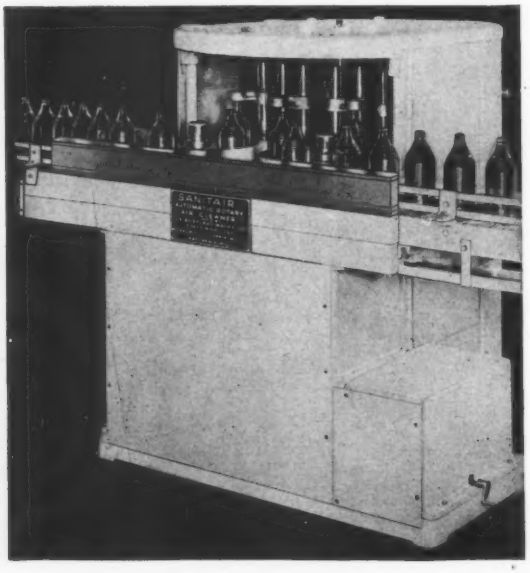
4—Sterilization is required for returned bottles which are to be re-used. Automatic bottle washer by Liquid Carbonic Corp. handles 5 units at a time

before the cycle is completed, and the bottle is discharged by means of a star wheel.

One rotary cleaner operates as follows: Bottles are moved from an intake conveyor through an escapement wheel which feeds a continuous flow of containers, properly spaced to eliminate all impact, into a spider which in turning feeds the bottles onto cleaning stations. Bottles move into position on the station platform and cleaning nozzles are operated mechanically to extend into the bottles, then the cleaning head rotates clockwise and, as the bottles reach an inverted position, a blast of air at pressures of 60–90 lb. is released through the nozzles; loosened dirt and dust are removed by this pressure and the residue is carried away by a vacuum tank beneath the intake conveyor. The cleaning head completes its vertical cycle and the cleaned bottles are discharged by a spider and delivered onto a discharge conveyor.

Still another type has a paddle wheel fitted with 12 vanes which sweep the bottles through a complete revolution in the vertical plane and apply one or more blasts of air as each bottle is in an inverted position. The handling is by means of three parallel chain conveyors. The first carries the containers to the paddle wheel and, by means of a deflector, to the second conveyor directly under the wheel. Thus, there is no sliding and a positive forward movement is imparted. After being cleaned, the bottles are deflected to the third conveyor which carries them to the filler. When container shape or size is changed, the paddle wheel as a whole is removed and replaced with one of proper shape and contour. The hub of the wheel is not fixed, but is a clutch, mounted so that the openings at the infeed and the discharge ends will present no hazard which might cause damage to the containers.

5—Here bottles are being automatically air-cleaned on a unit built by U. S. Bottlers Machinery Co.



Speeds as high as 120 containers per min. are attained by the two latter units. Both are quiet in operation. The former, in fact, is quieter when loaded than when operating empty at which time there is the noise of the air jet. Each is fitted with 12 nozzles; hence a speed of 120 containers per min. is attained at a machine speed of only 10 r.p.m.—the former in a vertical, the latter in a horizontal, plane.

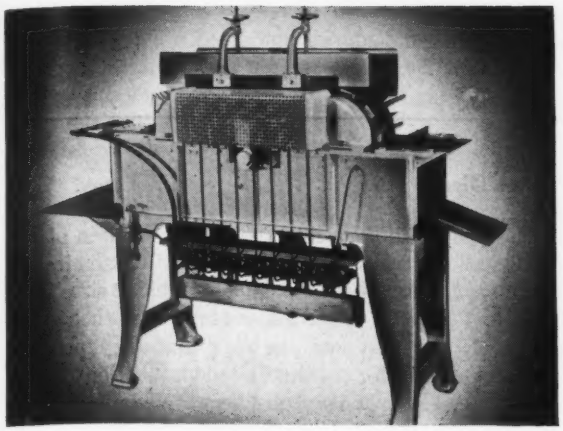
Five types of air cleaning equipment have been employed in one plant despite managements' general insistence upon standardization. In this case, the required shapes and line speeds prevented standardization. This suggests that every type of equipment should be considered, and that purchase should be made on the basis of the performance of the unit on the line in which it is to be used.

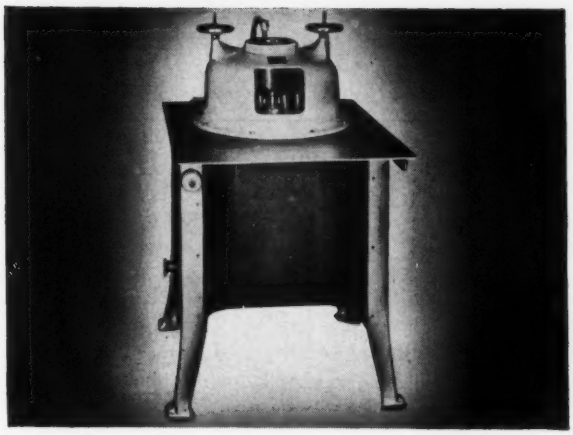
Soaking and washing machines

Soaking and washing machines were designed to meet the far more complicated cleaning problems involved in the use of multiple trip containers. Such containers frequently require the removal of an old stained or torn label as well as liquid, viscous and solid foreign matter. Re-use containers have had opportunity to collect every sort of contamination—germs, dirt, grease and grime—and thus require the most effective form of thorough cleansing and sterilization obtainable.

Usually, machines of this sort first rinse the bottle to flush out loose dirt, flies, etc. The initial rinsing also serves to preheat the bottles for the high temperatures of the solutions used in the following processes. Soaking in hot alkali solutions then follows to remove labels, adhesives and all forms of dirt deposits. Frequently devices for brushing both the interior and exterior of bottles are included as an integral part of the machine so that mechanical cleaning supplements the chemical. The next operation consists of rinsing both interior and exterior, to remove all cleaning solutions. Finally, the containers are drained and, in some instances, drying is also required.

Machines range in size to meet varying production needs. In basic design, these machines may be essentially alike, and they use chain belts equipped to





6—(Left) Ampuls, tubes and similar glass containers are thoroughly sterilized with this unit by Perfektum which automatically feeds, cleanses and discharges the containers. 7—(Right) Rotary ampul washer by Perfektum.

hold 1–12 or more bottles per link. Feed and discharge may be automatic and directly off a conveyor or, in some cases, they may be semiautomatic, using magazine feed or hand feed.

Production speeds, that is, the number of bottles held per link of chain or belt, vary with the width of the machine and with the size and type of container. Thus, an essentially identical machine designed with a four-bottle-wide belt will have a capacity of up to 32 bottles per min., whereas an eight-bottle-wide belt machine will have a capacity of 48–64 bottles per min. appropriate for large runs where greater production speeds are required.

Ampul washers

Another development during recent years has been the ampul washer. Models of this type are available which automatically feed, cleanse and discharge ampuls, tubes and other similar glass containers.

The operator of this recently developed machine takes the tubes or ampuls as received from the manufacturer and places them on the loading channels. They are then automatically aligned with the washing needles, placed thereon, and moved through successive cleansing, washing and drying operations. The ampuls are subjected to the action of a cleansing substance throughout eight stations and discharged onto a conveyor. They are then ready for the autoclave or for filling and sealing operations.

The operation described above is continuously intermittent, allowing enough dwell period at each station to ensure washing and drying without the risk of mixing the fluids. A rotary type of ampul washer is also now available.

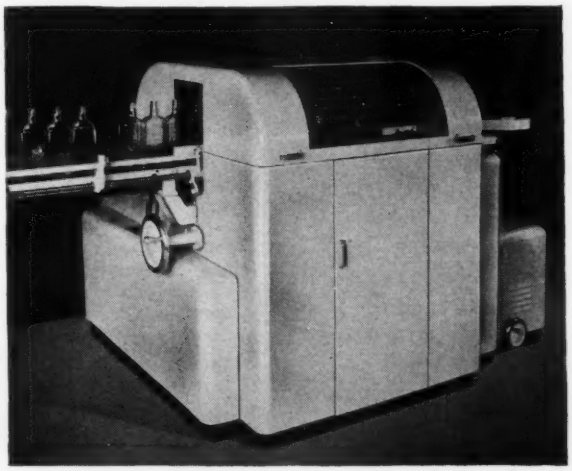
Case unloaders

Before closing the subject of bottle cleaning, mention should be made of a companion piece of equipment that is a relatively new development and is finding wide application. This is the case unloader, the so-called unscrambler.

One typical unscrambler consists of a tilting table to facilitate unloading the empty containers received in inverted position in the cartons, a continuously rotating disk, and devices for separating the bottles and feeding them singly to a conveyor belt preceding the cleaner. They are discharged at the cleaner. The single-tier case of empty containers is opened and tipped on the tilting table. The table is raised to a horizontal position, the case is lifted from the containers, leaving them standing, bottom down, on the level table. The next case pushes the already uncovered empties onto a revolving disk which feeds them to the conveyor leading to the bottle cleaner.

One man can unload as many as 150 empty containers per min. to operate the production line continuously at full speed. Not only will such an unscrambler handle round or octagonal bottles, but it handles round cans as well.

8—Automatic air cleaner by Pneumatic Scale Corp. is quickly adapted to a wide range of sizes and shapes.



Filling liquid products

The choice of a liquid filling machine depends upon the physical and chemical properties of the liquid, upon the size and kind of container and upon the production speeds required.

Four mechanical principles form the basis of design of filling machines: pressure, siphon, accurate measure and vacuum. Each has definite advantages and limitations which will be discussed below.

Pressure fillers

In the most simple type of pressure filling machine, the flow of the liquid was formerly cut off by pinching the draw-off hose with thumb and finger. In modern machines, a whistle or "press on it" valve is used for this purpose. The valve may be rigidly mounted so that the nozzle looks down, thus eliminating the necessity for inserting the nozzle into the neck of the container for filling. The rigidly mounted valve is quickly closed as the container is withdrawn, and a more uniform height of fill is maintained. Two small containers may be filled by the operator at a time, one with each hand, and speeds of 20–30 per min. can be attained by this method.

The pressure principle employed in the simple hand devices is also used in semi- and full-automatic machines. Such direct pressure machines require that the neck of the container be sealed. To accomplish this, a sponge rubber gasket is usually employed. Through the gasket is passed the filling stem which contains passages for both liquid and air. As the product flows through the gravity head under pressure, the air which is displaced from the bottle escapes through the passage provided in the filling tube.

Siphon fillers

The siphon filling machines are widely used in plants of all sizes because they are simple and economical to operate, very easy to clean, and adaptable to sizes from 1 oz. to 1 gallon. Other major factors are their comparatively low cost and the fact that they produce excellent results for medium sized production over a period of years. The siphon fillers are adaptable to a number of products including liquids which foam easily, liquids which are fairly viscous, corrosive liquids and volatile liquids. The capacities of the siphon fillers vary from 10 to 30 containers per min., depending upon the size of the containers to be filled.

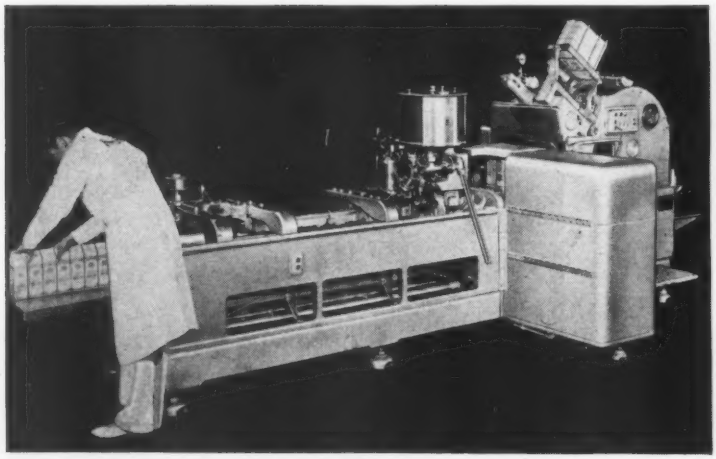
The smaller containers can be fed to the siphon fillers two at a time and production is thus materially increased. This may be accomplished if the stems are properly spaced and the operator feeds one container with each hand.

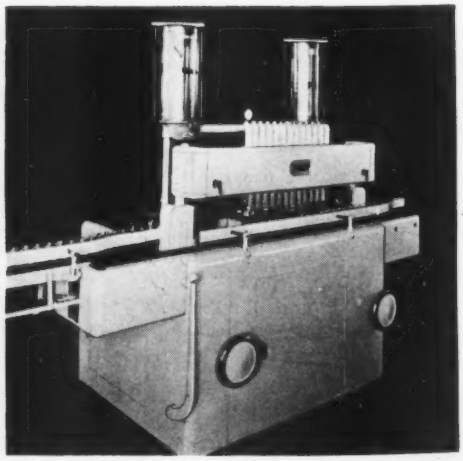
Accurate-measure fillers

Some liquids are so expensive that variations in container capacity present a problem if they are filled to a uniform height rather than with an exact amount of the liquid. Therefore, the accurate-measure fillers are the most suitable for such expensive liquids. Other filling machines, with the exception of the weighing liquid fillers, fill all containers of the same size to the same height. Due to variations in container capacity, the same amount is not put into each container.

The accurate-measure fillers are also especially suitable for filling metallic, opal glass and earthenware containers since the level of the liquid within the con-

1—(Left) Machine by Ex-Cell-O Corp. will form, sterilize, cool, fill, seal, date waxed milk containers.
2—(Right) Automatic vacuum filler designed by Pneumatic Scale handles 24 small containers simultaneously.





tainers cannot, of course, be seen. Furthermore they are most suitable for filling tin cans of rectangular shape, as the use of the vacuum-principle filler has a tendency to decrease the capacity of the container by collapsing the walls to a certain degree. Production of 25–40 containers per min. can be attained.

Vacuum fillers

Drip and the filling of defective containers can be prevented by the use of a variant of the direct pressure construction known as the "gravity vacuum." In this design the supply tank, mounted above the filling tubes, is kept under vacuum, so that a vacuum must be created in the container before the liquid can flow into it by gravity.

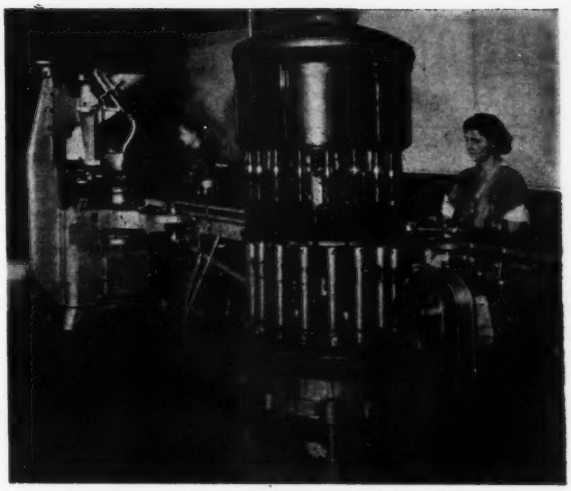
In fully automatic equipment, the straight vacuum, the gravity-vacuum and gravity principles are frequently used. In the vacuum construction, the float-controlled supply tank is mounted below the filling tubes. The containers are sealed, as in the direct pressure units, and the air is withdrawn from them. The reduced pressure thus produced causes the liquid to be drawn into the containers, the overflow going out through the vacuum tubes, just as it does in the pressure machines. The liquid is separated from the air by an automatic trap, the fluid being returned to the supply tank and the air escaping through the vacuum pump.

Bottom discharge filling stems are widely used on both rotary and straight-line vacuum fillers. However, these stems discharge the liquid violently into the bottom of the bottle and agitate it unduly, resulting in excessive loss of liquid due to evaporation. By replacing the bottom discharge stems with ones having side openings which permit the liquid to spray against the side walls of the bottle and run down, the speed of the filler can usually be materially increased. This increase may be as high as 25 per cent, and smoother operation and more uniform height of fill will result.

Improvements in filling equipment

Machines have been developed which have devices guaranteeing protection against possible damage from carelessness on the part of the operator, from choke-neck or misshapen containers, or even from the stopping of other machines in the line.

Operating speeds of automatic filling machines have been substantially speeded up to as many as 300 bottles per minute. Of course, speed, while of great importance, is but one of a number of considerations by which a filler should be judged. Among other important factors are ease of adjustability and ease of cleaning. The latter is particularly important in preventing a tie-up of production between runs if more than one product must be filled. Machines for foods and chemicals are often made with stainless steels or other reaction-resisting materials on all parts coming into contact with the material being filled. Filling machines must have capacities which tie in properly with the other equipment on the assembly line, and if they are to be used on various sizes, they should be quickly and easily adjustable.



3—This rotary filling machine by Horix is built with fully automatic feed and discharge mechanisms.

Sometimes a semiviscous liquid may flow too slowly to a siphon or pressure filling machine, particularly if the gravity head from an elevated tank or mixer is not very large. The following arrangement may be satisfactory in such cases: interpose a small centrifugal pump in the pipe or hose line from the tank or mixer to the filler, and hook the intake side of the pump directly to the liquid supply. The discharge side should be provided with a tee, one arm discharging to the filler, the other arm returning any excess delivery back into the top of the tank or mixer. The hose or pipe carrying this excess can be elevated or lowered to give any desired rate of flow at the filler.

With competition promising to become increasingly keen, the uniformity of the fill height of liquids in flint glass containers is more important than ever. Uniform height of fill can be maintained on modern equipment, whether it be fully automatic or only semiautomatic. In the case of those products having a high alcoholic content, whether for beverage or cosmetic use, a fairly large head room must be allowed due to the high coefficient of expansion of the contents. In all other products, the fill height may well be maintained to the base of the neck or, better still, well up in the neck in order to obviate the adverse reaction a slack fill has on the consumer.

Filtering equipment ties in with filling devices. Former practice was to perform the filtering operation when the bulk product was transferred from the mixing tank to the storage or bottling tank. Now, however, it is common practice to place a polishing filter just ahead of the filler. It is also good practice to filter the overflow from pressure and vacuum fillers before returning it to the bottling tank or filler to be used a second time.

Filling pastes and creams

A wide variety of equipment, hand operated, semiautomatic and fully automatic, is available for filling containers with creams and pastes. If the product is not too viscous, certain liquid-filling equipment may be utilized (see p. 718). Also, machines used for filling collapsible tubes (see p. 726), can be adapted for filling pastes and creams in wide-mouth bottles and jars.

The metering machine, which delivers the product to the container either by measured volume or by measured weight, is perhaps the most widely applied type for this operation. The constant-volume type consists basically of an accurate pump having piston or rotary impellers and is obtainable as hand-operated, semiautomatic or fully automatic equipment.

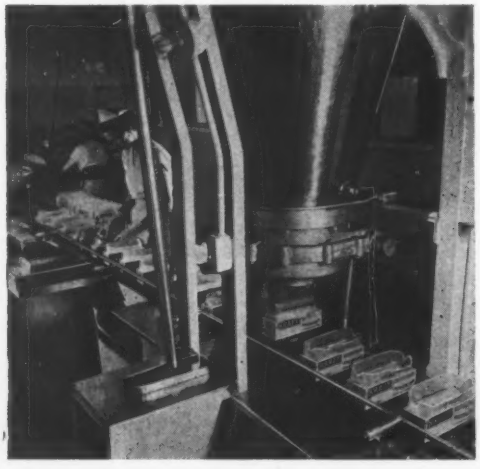
Hand-operated metering units are generally constructed with a piston pump, a hopper in which is loaded a batch of the material to be filled, and a spout to which the operator presents the containers in time with the stroke of the piston. With some products, it is necessary to keep the tip of the spout immersed in the fluid as it is ejected into the container, thus eliminating air pockets. When using hand-operated machines, the operator must remove the container at the proper speed to accomplish this.

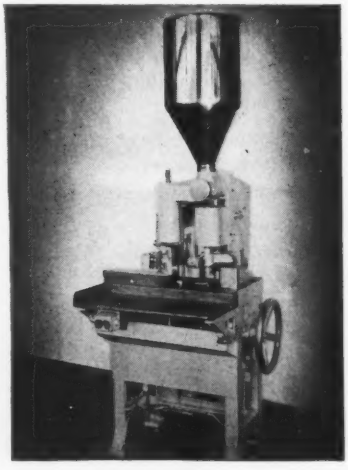
Semiautomatic and full-automatic machines of the piston type operate on a similar principle, but they employ two or more piston pumps along with a conveyor which intermittently carries the containers forward. A cam-operated table raises the containers at the filling station and lowers them away in timed relationship with the piston stroke. The containers can be automatically discharged onto a conveyor for all the subsequent packaging operations.

Fully automatic, constant motion, rotary machines are also available. This type of equipment can be hand fed by an operator who places empty containers on the trays of the machine, and is usually recommended where a wide variety of shapes and sizes must be handled. These machines can also be fed automatically and are well adapted to conveyor line setups where previous and subsequent operations are to be performed. For this purpose, a star wheel automatically removes the containers from the conveyor for filling and automatically returns them to the conveyor after filling.

Rotary machines fall into two general classifications. In one, a series of piston pumps is mounted above the containers and rotates with them, so that each piston stroke fills the container below it. In the other type, there is a pump of the rotary-impeller or piston type, depending upon the product to be handled, and a valve head is arranged so that the entire discharge from the pump is ejected into one, and only one, container at a time. In recent years, this type of equipment has been greatly improved so as to give greater speed, cleaner filling and a wide capacity range with minimum changeover time. Safety appliances, such as "no jar–no fill" devices, have been added to render the equipment foolproof. With the rotary impeller pump, a great advantage is that a constant velocity of material flows through the machine in one direction, thus minimizing wear and thereby maintaining accuracy indefinitely.

In constant-weight measuring equipment, a scale is an integral part of the machine. As the container is filled to a point where it becomes as heavy as a predetermined weight which is placed on the other platform, the balancing of the scale causes the filling valve to be tripped and stops the flow. These units are principally hand operated, and are generally no faster than an operator working with a hose having a whistle-valve. However, they offer the distinct advantage of clean and accurate filling.





1—(Left) Built by Frank D. Palmer, Inc., this fully automatic unit is employed for filling cheese. Here boxes containing bags are filled with hot cheese from a pasteurizer. 2—(Right) Arenco semiautomatic jar filler with a surface-leveling device has a capacity of 1500 per hour.

Capping and sealing equipment

The variety of closures used in packaging (see p. 376) and the range of speeds with which they must be applied to containers under different operating conditions, have demanded equipment which includes the simplest hand types as well as fully automatic machines. Appropriate units have been devised to meet practically all needs. Today, there is corking, capping and sealing equipment for applying screw caps, lug caps and plain skirt caps, crowns, straight and tapered corks and vacuum caps. They operate on conveyor lines in conjunction with, or are even synchronized with, the equipment employed for the filling, labeling and cartoning operations.

Screw caps

The application of screw caps, whether they be small for bottles or large for jars, is not so difficult a problem as it appears to be. Many types of capping machine are available. For small runs or small capacity, the hand closer strapped to the operator's hand still finds some application. It is a fatiguing operation at best, and the most that can be said for it is that it will not blister the hands, a situation usually found when out-and-out hand capping is used.

Next in point of capacity, efficiency and low cost are the portable electric screw cappers of which a number are now available. They are truly portable, weighing only 5–28 pounds. They may be suspended from the ceiling, mounted on the work bench or conveyor tables, or suspended on a tubular bracket support fixed to the floor. They can handle caps ranging in size from the smallest 10-mm. vial cap to large 90-mm. jar caps. The caps may be made of plastic or metal, they may be round or angular, single or double shell, shallow or deep, and they may have continuous or broken threads. With the proper complement of chucks to handle the different sizes, they will perform almost any capping operation. Screw caps must be set on and started by hand.

Since they drive through a flexible shaft, the devices will cap over a considerable area, which means the containers need not be handled. In fact, containers can be capped while moving down a conveyor, or a whole tray of containers can be capped without being disturbed.

These units can be adjusted so that every cap will be applied at the proper tension in order to ensure a proper seal and still be easily removable by hand as required by the consumer.

When the cap is properly designed so that the lead threads readily follow the thread on the glass, thus preventing any tendency to cross thread, and the liners are glued into the cap or attached in a satisfactory manner so as to prevent their falling out of the cap, it is possible to employ automatic equipment in the application of these closures in order to ensure a satisfactory sealing.

Turn-on caps

Several machine types are available for applying turn-on caps. On some of these, it is only necessary to dump the caps into a hopper from which they are systematically sorted and fed to the machine in relative coordination with the reception of containers from the filler. On others, generally referred to as semiautomatic cappers, it is necessary to start the cap on the container by hand. Regardless of the type machine employed, the cap must be applied with the proper tension so that a perfect seal is achieved, not only with the top of the bottle, but also with the cap liner.

Semiautomatic machines are of the same general construction and size as the fully automatic ones. A wide range of types is available. They are installed in production lines as are the fully automatic machines. They are equipped with feed conveyors and discharge conveyors, and the containers are both fed and discharged automatically.

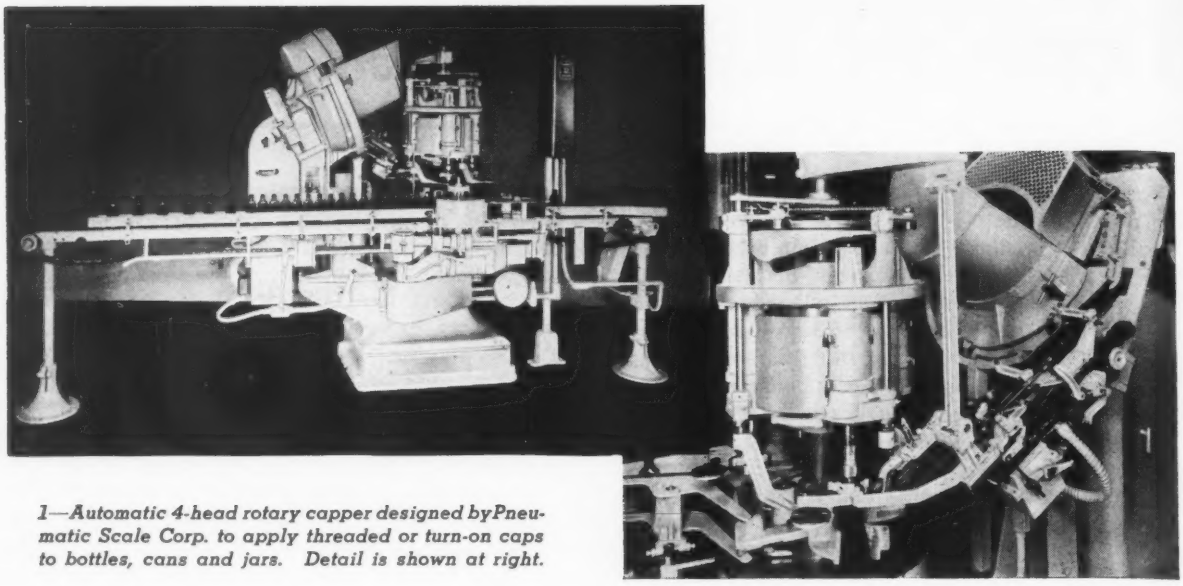
The smallest semiautomatic machine is generally a single-head machine designed for operating at capacities of 30–45 units per minute. In order to obtain a larger capacity, it is necessary to employ a machine which is equipped with a number of spindles rather than with a single head.

These large machine units are usually of the rotary type. In practically all cases, they are identical to the fully automatic machine but they do not have the automatic cap-feeding and applying mechanism which is incorporated in the fully automatic units.

Another variation of the semiautomatic capper is the type which uses a belt cap-feed onto which the operator simply feeds the caps. From that point on, operation is completely automatic. This method is often used with closures such as deep-skirt plastic caps which are of a type or shape not suited to automatic sorting and automatic feeding.

The semiautomatic unit can be readily changed from one size container and cap to another, and the cost of attachments for the different containers is within reason. On the fully automatic machine, a change-over for size requires a longer period of time, and the attachments, of course, are much more costly.

In regard to larger capacities, machines which are fully automatic are sometimes found to be far more desirable inasmuch as their greater efficiency will reduce the packaging production costs considerably. Automatic units are most profitably adapted to those pro-



1—Automatic 4-head rotary capper designed by Pneumatic Scale Corp. to apply threaded or turn-on caps to bottles, cans and jars. Detail is shown at right.

duction lines which operate at a capacity of 45 or more containers per minute. There are, however, many cases where a steady production of 35–40 containers per min. is needed and sizes are suited to automatic production. In such cases, a full-automatic, single-head unit or a slow-speed, multiple-head unit may be desirable.

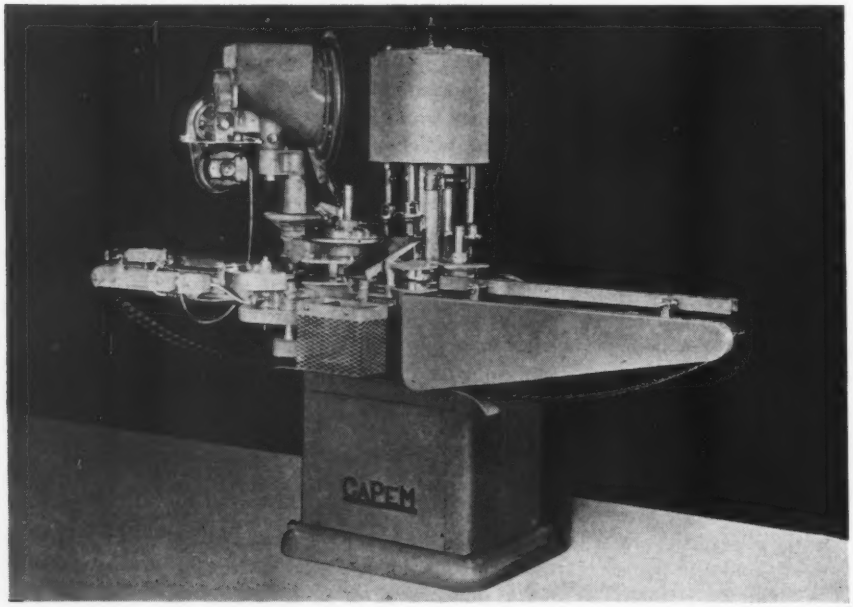
A recent development replaces the familiar hopper with a worm feed device. Since this eliminates the necessity for agitating and jumbling large masses of caps in a hopper, it permits the handling of delicate types which could not previously be handled automatically, and it is particularly suitable for those types of closure in which the diameter is exceeded by the height.

Crown caps

Crown caps are frequently applied by equipment which forms an integral part of bottle-filling machines. However, separate rotary crowners of the fully automatic type are available. These are very similar, in feed and general structure, to rotary turn-on closure cappers, except that they substitute a crown-forming pressure for the turning action of the ordinary capper.

Miscellaneous types

Hand and semiautomatic devices for applying crown caps, milk bottle caps, foil and paper hoods for milk bottles and many other specialized types of closure,



2—Any type of rotated closure may be applied to bottles, jars or cans with this high-speed rotary capping machine manufactured by Consolidated Packaging Machinery Corp.



3—*Dairy cellophane or parchment and banding material in roll form are applied to milk bottles with the Package Machinery Co.'s hoodingequipment. A variable speed drive permits capacities of 15–40 per minute. The conveyor may be hooked up to the discharge of a filling machine of like capacity and only one operator is needed for both machines.*

or for applying super or secondary closures, are also available and similar in principle to those described.

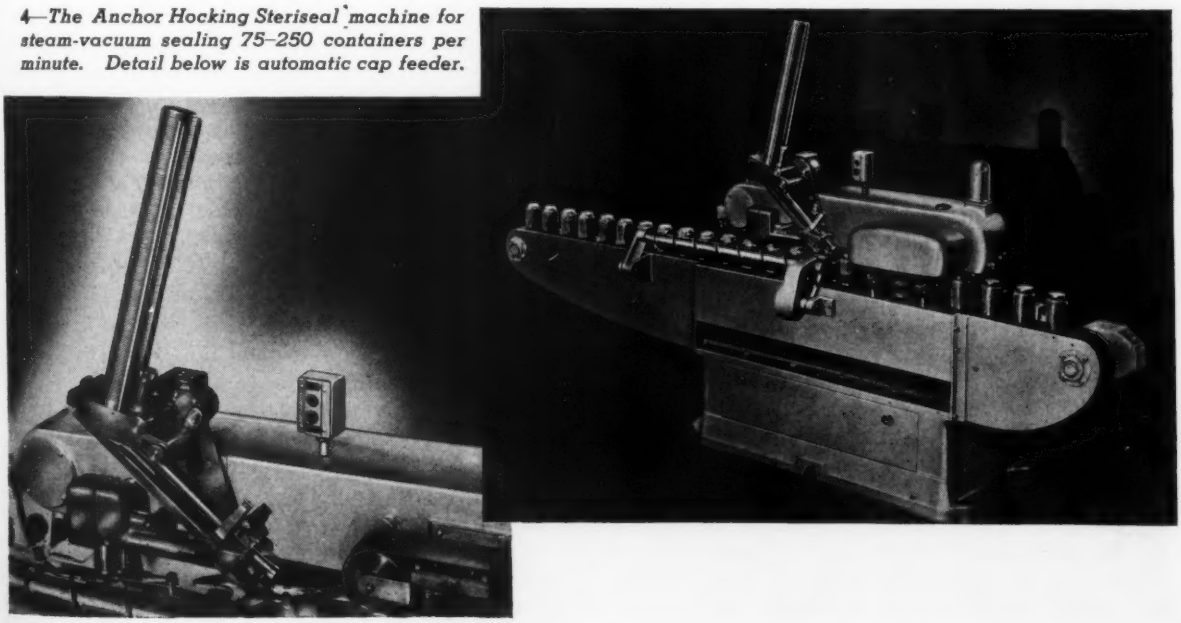
So-called roll-on caps are applied by rotary automatic machines which position the unthreaded cap on the bottle and hold it in place under the desired head pressure while revolving rollers form the cap metal to the shape of the bottle thread.

Vacuum sealing

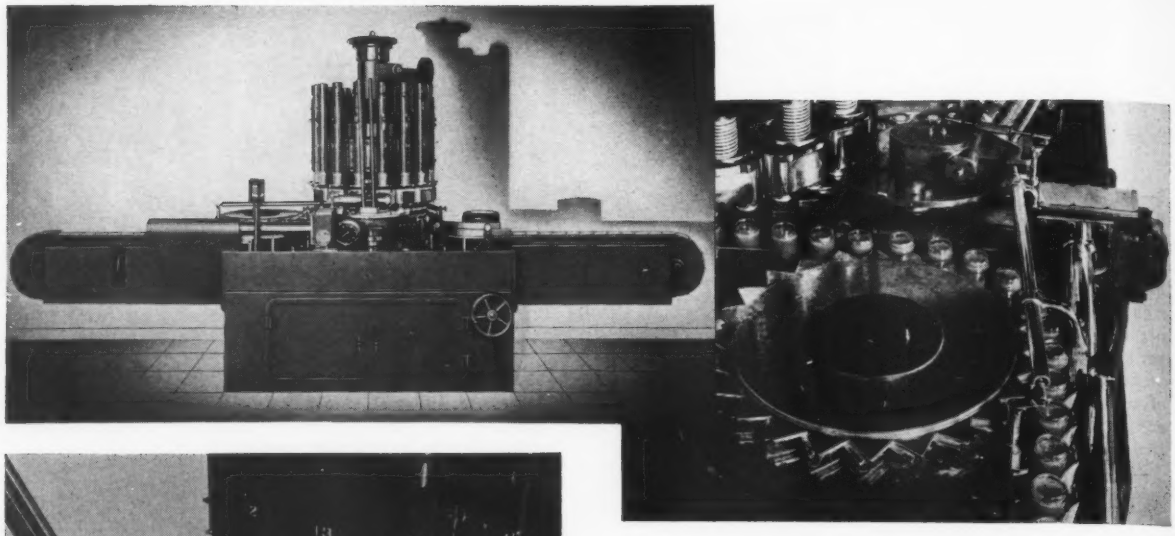
In general, the result of the use of vacuum is that action of oxygen as a destructive agent is so retarded as to be negligible. Advantages of vacuum sealing are:

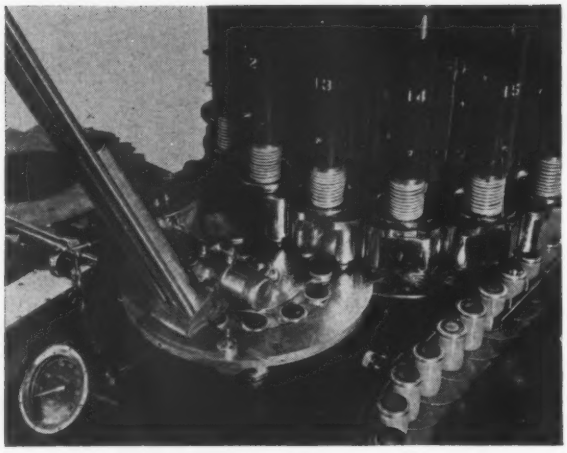
1. The prevention of rancidity of oils and fats contained in food products. Even though this deterioration may take effect slowly, it is difficult to foresee how long a package may remain on a dealer's shelf. Even slight rancidity is enough to affect adversely the flavor of many packaged food products.
2. The elimination of discoloration due to oxidation. No "off color" product is appetizing.
3. The preservation of delicate flavors and aromas—particularly true where a mechanical vacuum is used.
4. The retarding and practical elimination of the

4—*The Anchor Hocking Steriseal machine for steam-vacuum sealing 75–250 containers per minute. Detail below is automatic cap feeder.*



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5—*Volume production is attained with this 16-spindle vacuum sealing machine by Anchor Hocking. The detail above shows feeding of filled containers, an operation controlled by a timer which permits random feeding at any speed. Detail at the left is a close-up of the discharge where the sealed containers are automatically ejected from the machine.*

growth of mold and yeast. The rapid multiplication of these micro-organisms is dependent on the presence of air.

5. The effective reduction of the corrosive action of acids and other chemical properties of food products. Corrosion is a process of oxidation and hence a process which may be stopped through the use of a vacuum.

In general, there are two types of sealing machine for the application of metal caps under vacuum—mechanical and steam. In the mechanical type, there are two styles. One effects a vacuum seal by means of a vacuum pump and the other creates a vacuum by means of a piston arrangement built in the machine itself.

Mechanical vacuum-sealing machines are available in a variety of styles, ranging from the simple, hand-fed types to the completely automatic ones. These machines are designed to apply caps. under vacuum, to jars, tumblers and bottles.

The development of vacuum by the displacement of air with steam provides a unique and highly important characteristic in that the vacuum is formed after the closure has been applied, thus preventing the sucking out of a cold-packed product from the container or the boiling over of a hot-packed product. Mechanically, the steam-vacuum system is simple. No vacuum pumps are used. All that is required to operate the system and the capping machine are a steam supply and an electrical current. While the primary purpose of the steam is to displace the air from the head space, it also serves a secondary function in that it sterilizes the cap and creates a sterile atmosphere for the capping operation. In general, the speed of the machine may be adjusted to the convenience of the packer, and the machine can be set into packing conveyor lines. Most varieties are readily adjustable for differing jar or tumbler sizes and styles, and for varying closure sizes. With the steam types, regulation of the degree of vacuum can be governed by the amount and temperature of the steam atmosphere. With the mechanical types, such regulation is effected by adjustments of the pump controls. (For further data about vacuum packing see the following: *Hermetic, Vacuum and Gas Packaging*, p. 48; *Vacuum-Gas Packing of Foods in Metal*, p. 329; *Vacuum Packing in Glass*, p. 390.)

Corking methods

Some packagers still drive corks home with the aid of a rubber mallet. For small runs where the corks are tapered, where the corks and containers are of small size, and where the tray system of handling is used, the corks may be set in the necks by hand and then, with the aid of a press, forced in tight to a predetermined point. One tray at a time is handled in this manner.

For sizable runs, the corking wheel on a conveyor is used. The bottles may be discharged automatically from the filler to a chain conveyor. The tapered corks

are set lightly in the necks by hand and pass under a corking wheel about $2\frac{1}{2}$ ft. in diameter. The wheel in one type is set on an arm and the dead weight pushes the corks home. In another type, the wheel is rigidly supported so that uniform pressure is applied while the peripheral travel of the wheel is identical with the lineal speed of the conveyor. Any tendency for bottles to topple over is thus eliminated. In either case, the position of the corking wheel is adjustable, so that corks may be allowed to protrude the desired distance and so that it can be quickly changed over to handle bottles of a different size or type.

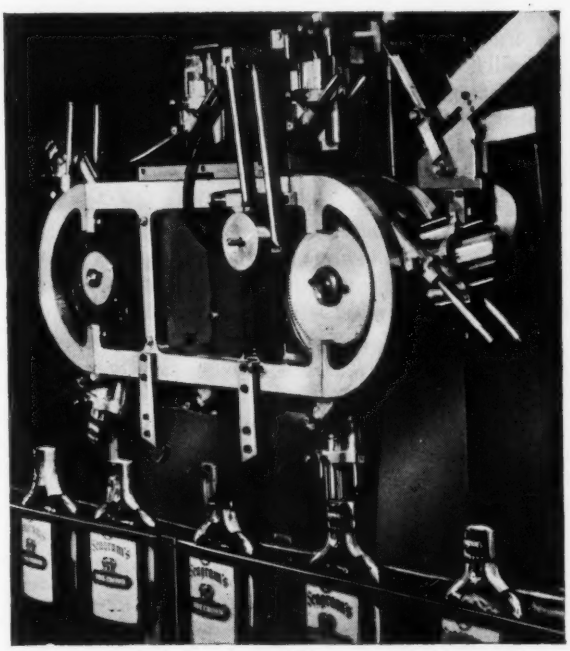
A modified corker substitutes an endless inclined belt, running over two pulleys, for the corking wheel. A rigid metal plate behind the slanting lower portion of this moving belt forces the corks firmly and evenly into the container neck.

The straight cork, widely used for still and sparkling wines, requires a specialized machine. This unit compresses the diameter of the pretreated cork so that it is slightly smaller than the interior neck diameter of the bottle. A plunger forces the cork home from above. Two other machines, infrequently used, are the plunger and bar types, which are worth investigation for certain work. As the names suggest, the plunger on the former type pushes the cork in. The bar on the latter acts as a stop as the bottles are raised on an elevating table.

Fully automatic corking units have been devised recently for a number of special applications. In one such machine, corks are placed in the correct position in the corking head for driving into the bottle neck by a positive air-pressure feeding device. Corks are hopper-fed into a channel that directs each cork to the correct position and register before insertion in the bottle neck. A hopper of large capacity is so designed that a casual glance from the line operator will determine just when a new batch of corks is required to keep the line in continuous production.

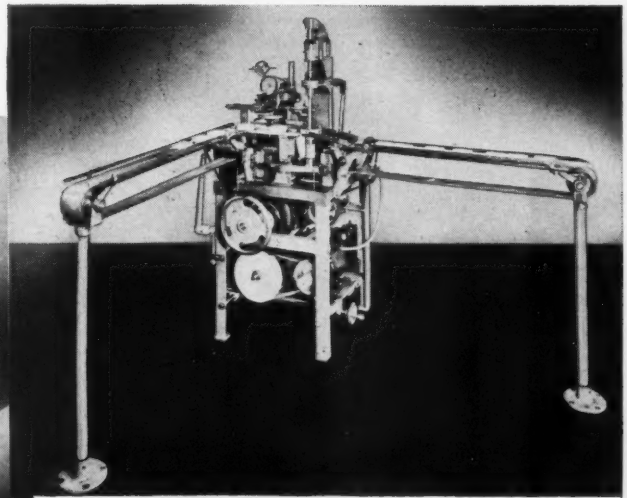
Feeding of the filled, but uncorked, bottles into the machine is controlled by an electric feed switch. The machine is so designed as to stop automatically whenever a "break" appears in the line of the advancing bottles. It does not start again until the break is closed. The machine is equipped with a variable drive, making possible its operation at exactly the speed called for by the production schedule and its synchronization with the other units of a well-organized packaging line.

6—Automatic application of contractible cellulose bands to the necks of liquor bottles. Such bands may be applied over the revenue strip stamp with this equipment by Wright's Automatic Machinery Co.



7—Bands of cellophane-backed acetate fibre are sealed around container lids on equipment by Package Machinery Co. Below, typical packages.





Tube filling, closing and sealing

In the selection of tube-filling equipment, four important factors should be considered: the consistency of the material, the temperature at which it can be filled (whether it can be filled warm or must be filled at room temperature), the range of tube sizes and the required or anticipated production rate. The equipment may be hand operated, semiautomatic or fully automatic.

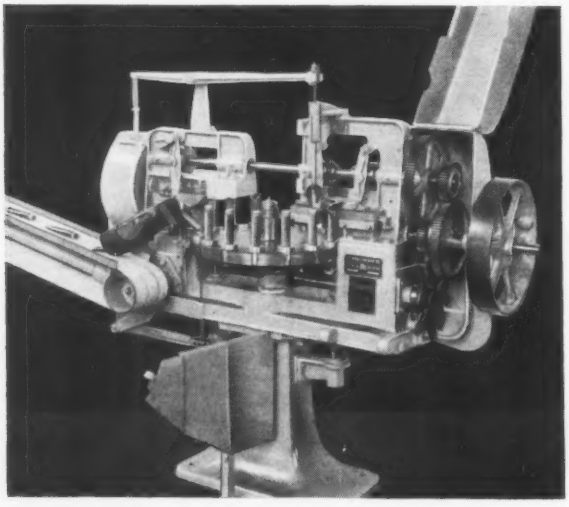
Liquids and semiliquids which are self-leveling and will flow by gravity, are quite easy to fill, since the material can be filled from the top, will fill uniformly and will be free from air bubbles. Furthermore, the material can be easily fed to the hopper of the filler and will flow, by gravity, into the filling mechanism.

Creams, ointments and similar pastes that will not normally flow by gravity can sometimes, if they are warmed, be handled in the same manner as liquids and semiliquids. In these cases, machines may be equipped with jacketed hoppers and agitators which maintain the material at a uniform temperature. In many cases, simpler immersion heaters may be employed.

Before adopting the method, it is important to determine whether or not the material shrinks excessively on cooling. If it does shrink, the tube wall buckles and becomes unsightly and the tube has a slack fill or appears to be empty.

If the material can be warmed, the filler can be merely a whistle valve (a quick-opening, quick-closing hand valve), located on the mixer discharge or on a hopper, and the tubes may be filled in the half-gross cartons in which they are received. After cooling and normal shrinkage have occurred, the tubes are closed, clipped and packed.

1—This F. J. Stokes machine seals tubes with hermetic clipless closures and it may be adjusted for crimp or clip closures. It may also be converted for semiautomatic tube filling, closing and sealing.



Tooth pastes, shaving creams and those products which will not flow by gravity, must be filled by slipping the tubes all the way over the filling nozzle to prevent air pockets. The simplest filler for this type of material resembles a sausage press or stuffer. However, the cylindrical hopper and piston must be ground true to avoid leaking as head pressure is applied. The tube is pushed on, and held over, the nozzle while the handle is rotated sufficiently to fill it. Then, by backward motion of the handle, discharge is "broken off."

The hand-operated type, employing a hopper under air pressure and an auxiliary piston fitted with three-way valve, is actuated by a complete turn of the handle, and uniformity of fill equal to that of a fully automatic filler is obtained. In some hand-operated models, gears are used to draw the material from the nozzle and expel it through the hopper.

The semiautomatic piston fillers differ from the hand-operated ones only in that the power stroke clutch is actuated by a foot treadle, and both of the operator's hands are free to handle tubes. Either of the piston machines will fill jars if the horizontal nozzle is replaced by an L-shaped discharge tube looking down.

With these simple, small-capacity fillers, the closing operation as well as the setting of the clip or crimping of the clipless tube are accomplished on one or two separate machines which may be operated by hand or may be semiautomatic and power driven. The folding machine makes a double fold for clips or for products in which this type of fold is adequate. There also are models which will apply the quadruple fold. On a second type of machine, the folds are indented for strength, or a clip is clamped on by means of a foot-operated press. Certain models can be equipped with electrically heated jaws for applying hermetic seals.

A production of up to 30 filled and sealed tubes per min. can be achieved with two operators by using a general purpose filler and then transferring the tubes manually to a second machine which folds the ends and seals them. In the case of liquids, it is practical to put a filling attachment directly on the folding and sealing machine, in which case only one operator is required to achieve the same output. These machines can be equipped with variable speed drive, so that the speed can be adjusted for the work at hand.

Filling equipment of large capacity operates on one of two principles, namely, the rotary gear or the piston. Both will operate with a uniformity within $^1/_{16}$ oz. or less. In the gear type, an especially constructed spiral gear pump measures an exact quantity into each tube as it is carried around the filling head. Size changes are quickly and easily made, and some

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models have a variable speed drive so that the filler can be synchronized with the other equipment or operations on the line. The piston type is fitted with a three-way valve, and, as the piston draws back in the cylinder, the semiliquid flows, or the paste is drawn, to the cylinder. The valve position is automatically changed on the reverse stroke and the material is forced out through the filling nozzle into the tube. The piston is set to deliver a predetermined quantity by ready adjustment of the length of stroke. One type of machine is also equipped with automatic cap-tightening and tube-cleaning devices as well as a "no tube–no fill" feature.

A fully automatic machine is available which has four filling heads capable of filling up to 120 tubes per minute. The machine automatically removes empty tubes from the shipping cartons, which must be of special design. The machine registers the printed matter in alignment with the subsequently flattened end by photoelectric cell, and fills, closes and discharges the tubes ready for the cartoner. Only one operator is required.

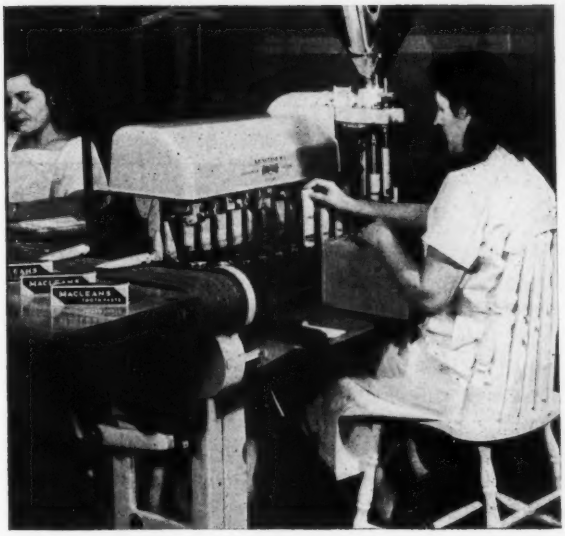
The simplest type of closure is a plain double fold which is neat and attractive in appearance and is sufficiently strong for materials such as rubber cement and glues which harden and prevent further seepage in case they leak into, or through, the fold. It is also satisfactory for thin materials such as bluing, flavor emulsions and pure food colors which are easily extruded and do not strain the fold when squeezed out of the aperture of the tube in use. This double fold can be strengthened considerably by indenting the metal of the fold.

So-called clipless closures consist of a quadruple fold, usually reinforced by corrugations. The ten layers of metal in the folds are as strong as a clip, and considerably more resistant to seepage and leaks. Tubes are available which may be hermetically sealed so that the usual four folds and the added tube length are not required. Still another type of closure requires an especially designed automatic machine which, after filling and flattening the end of the tube, shaves it and welds it securely. Here again, the added tube length for folding is not required.

If collapsible tubes of plastic or paper and foil come into common use, filling and, more particularly, closing equipment will need some modification. One company has developed a device, or change part, to effect a closure by heat sealing. Careful temperature control is imperative since too high a temperature will melt the substance and too low a temperature fails to form the seal.

The metal tube is ductile and holds its flattened and folded shape while the clip is put on and affixed by pressure. This is not the case with tubes made of other materials since they spring back into their original cylindrical shape. For these types, the machines must be adapted so as to overcome the natural rebound of the material from which the tube is fabricated.

It is apparent that a wide variety of equipment is



2—Unit by Arenco Machine Co. fills collapsible tubes, folds the bottoms and applies crimp closures.

available for handling collapsible tubes and that great care should be taken in its selection. To summarize, among the general points which should be given due consideration are:

1. If a range of sizes and a variety of products are to be handled, change-overs should be quickly effected. They should not be too complicated, and the outlay for mandrels and auxiliary parts should not be excessive.
2. If only products which can be filled in fluid or semifluid states are to be packaged, simpler, less costly equipment will often prove quite satisfactory.
3. If the product is a food, such as anchovy or sardellen paste, or a dentifrice, the machine should be equipped with a tube cleaning device or so constructed that a cleaning device can be affixed. Carton lint, cork or foil fragments or other extraneous material is extruded on the very first squeeze.
4. The equipment should deliver a full tube, regardless of what is packaged. One can ill-afford to short-change the purchaser. A full tube might be defined as one which does not appear to be slack filled before opening, which does not appear half full by the time the first squeeze has caused the initial contents to extrude, and one which appears to be full enough to extrude of its own accord if the cap were backed off—but won't quite.
5. The equipment should be able to close a tube which is well filled with any of the products to be packaged, and in so doing, it should not soil the end of the tube or the jaws of the closing mechanism. Wiping the tube by hand costs money, and stopping at intervals to clean the mechanism lowers production.

Bag filling and sealing

Until comparatively recently, there was inadequate provision for efficient automatic bag filling and sealing. For this reason, bags were generally used only by small producers who depended wholly or partly upon hand operations for accomplishing these functions. Due to the availability of automatic and semi-automatic equipment for efficient closing of cans and cartons, large producers were partial to this type of container, figuring that the saving of cost by efficient production would serve to outweigh the high cost of the package itself.

Today, however, the picture is different. Automatic machinery is now available which can perform one or all of the necessary operations in connection with bag filling and sealing. Machines are available which can feed, form, open, fill, check-weigh, close and seal the bags.

Bags manufactured by automatic machines usually have center seals and bottoms which are folded up or crimp sealed. The equipment can make single- and double-wall bags. It can form them of unprinted material or material with continuous or random design, or it can produce bags which are spot-printed with perfect registration.

A high production rate is attained by machines in the manufacture of uniformly produced, perfectly sealed and unusually strong bags. Machines are available in various ranges, some making bags as large as 17 in. wide and 60 in. long.

Such provisions as automatic labeling for custom packing are also available.

Machines are now obtainable for making pouch bags by one of two methods. Either two rolls are run with sealing surfaces meeting (in which case two parallel seals and one right-angle seal are made), or one roll is used, the material being folded in half and two parallel edges sealed. When the latter method is used, for maximum protection it is sometimes desirable to seal at the point of fold.

These machines were designed primarily for metal foil and asphalt-laminated stocks, and can handle printed or unprinted material. Bags as large as 24 in. wide by 60 in. long can be accurately produced and perfectly made.

Rotary bag-sealing equipment has met with great demand because of its high productive capacity and the simplicity of its operation. This type of machine may be used adjacent to filling equipment. Thus filling and sealing, though two distinctly separate functions, can be combined into an operation which can be performed by a single operator without any loss of production speed.

The rotary sealing machine may be used in conjunction with belt conveyors for the maximum utilization of its capacity. In many such cases, no operators are required. These machines are available in models adaptable to the requirements of all materials, whether they be glue sealed or heat sealed.

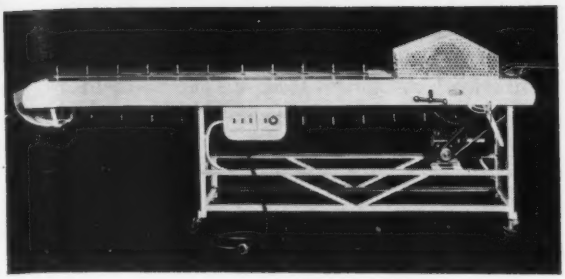
For specialized packaging of war matériel in pouch-type bags, supplementary equipment, which will be of use in peacetime packaging, was designed. This equipment makes it possible to open, form, fill and seal the bags on a straight-line, high-speed basis. It is so constructed as to facilitate extreme care in the handling of the contents.

Such additional equipment as roller conveyors, belt conveyors and air extractors completes the provisions necessary for the efficient handling of otherwise diffi-

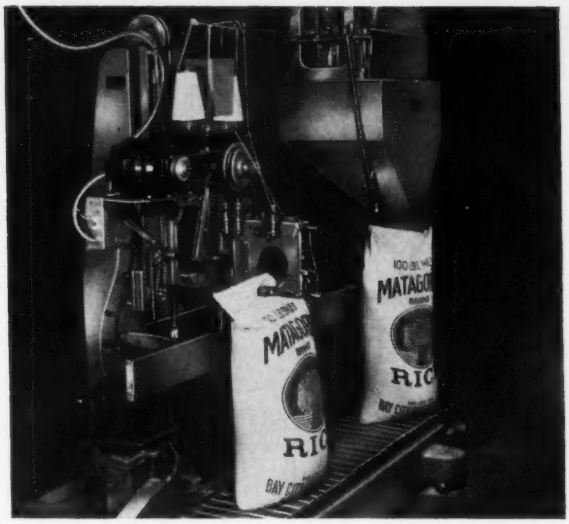


1—These bag-closing units by Benj. C. Betner Co. are installed in a coffee plant. Center machine makes a glue closure while the flanking equipment applies steel ties. Operational speeds are 32 bags per minute.

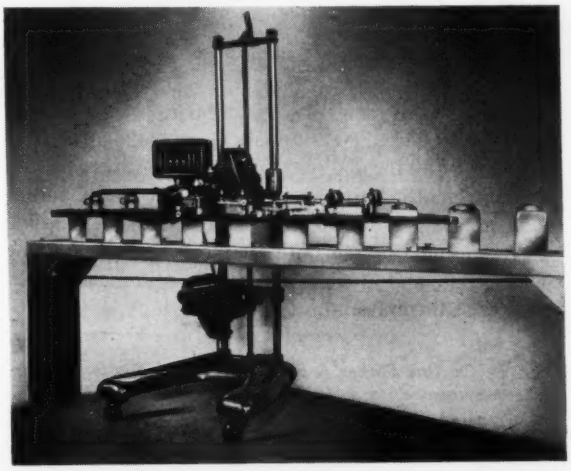
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2—(Above) Developed by Pack-Rite Machines, this unit heat seals cellophane bags of candy, cookies, etc. 3—(Right) Heavy-duty bags may be closed by stitching. This is a typical installation view of closing equipment by Consolidated Packaging Machinery Corp.



4—(Below) Without operators, bags are conveyed from fillers through this Amsco automatic rotary sealer.

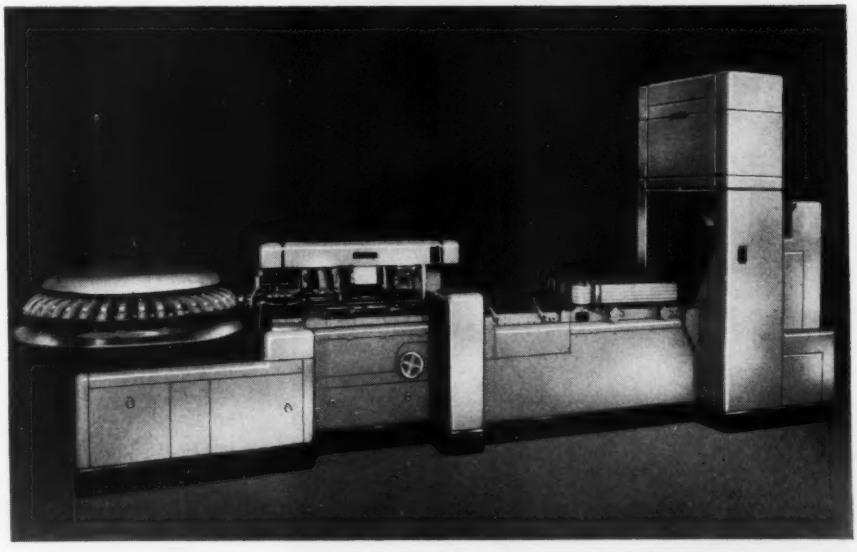


cult bag-filling problems. (See *Materials-handling Equipment*, p. 758.)

Introduction of automatic bag-packaging machinery in some industries has resulted in a surprising change in the appearance of the bag itself, for the automatic machine is capable of producing a bag closely approaching in appearance the neatness and attractiveness of the finest stiff containers. With these design potentialities to work with, bag suppliers and bag users have turned from the cruder forms of bag decoration to the use of the more attractive and decorative materials in the manufacture of outer bags.

Developed in almost every case to meet the specific needs of a single producer or industry, bag filling and sealing machines comprise a highly specialized group of equipment.

(See also *Specialty Flexible Containers*, p. 243; *Merchandise Envelopes and Packets*, p. 247; *Heavy-duty Multiwall Bags*, p. 255; and *Bag Sealing and Closing*, p. 260. For fuller data about the techniques and equipment for the heat sealing of bags, see the discussions in the articles on pp. 558 and 730.)



5—Bags are filled, weighed sealed and dried on this completely automatic, synchronized line designed by Consolidated Packaging Machinery Corp. It is employed for such products as coffee, sugar, rice, salt and for a variety of cereal products.

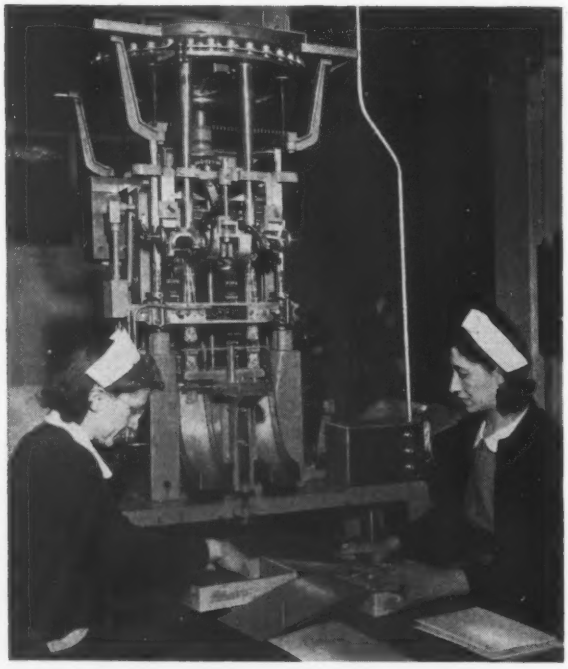
Heat-sealing equipment

Widely employed for the sealing of bags and of wrapping materials, heat-sealing equipment can be divided into two general classes: the reciprocal or jaw-type sealer and the rotary sealer. The simpler is the jaw-type, comprising two heated metal plates brought together by a mechanism which is operated manually or by a motor. The rotary sealer consists of two heated, motor-driven rollers through which the material is passed. New equipment based upon these principles has recently been introduced. The equipment and methods of applying it will be treated below. Further information may be found under *Heat-sealing Principles*, p. 558. Developments of the past decade are machines in which the heat for sealing is generated by high-frequency power. These are discussed on p. 734.

Types of equipment

There are two types of rotary sealer. One type employs two heated rollers through which the heat sealable material passes for sealing. The rollers in this type are of course motor driven. The second type of rotary sealer makes use of two thin endless steel belts which carry the film through both the heating zone and the cooling zone, and at the same time continuously apply pressure to the material.

1—On this Stokes & Smith unit, 60 packets per min. are formed from roll-fed film, filled, heat sealed.



Rotary and jaw-type bag sealers usually have sealing members which are made of brass and heated by electricity. Steel members are sometimes used because of better wearing qualities. The thermal conductivity of steel is slow, hence steel members are recommended only for automatic machines which handle bags at fixed speeds. This regular feeding rate permits the adjustment of the heat input to the heat output.

Most bag-sealing machines are semiautomatic, that is, they operate at the will of the operator. If possible, they should be fed the same number of bags each minute, for variations in feeding speed induce variations in temperature. If the bagging operations are intermittent, it is desirable to accumulate a batch of bags so that the sealing operations can be regular. This regularity in sealing operations permits fairly easy matching of the heat input to the heat output.

A new type of heat sealer, developed specifically for the heat sealing of uncoated thermoplastic films, is shown in Fig. 3. It permits the accurate control of the important variables in heat sealing: temperature, pressure and time. By this control, the machine is able to meet the exact conditions necessary for heat sealing oriented films as well as the usual thermoplastic and heat-sealable foils. In operation, the film is loaded into one end of the machine and firmly held by endless stainless steel belts as it is carried into the heating zone which comprises two opposed copper bars heated by resistance heaters electronically controlled to hold the bars to within a single degree F. Heat is transferred rapidly through the thin metal belts, causing the sheets of thermoplastic film or heat-sealable material to flow together. From the heating zone, the belts carry the softened film into an air cooled zone. This equipment will seal films made from polyvinylidene chloride, rubber hydrochloride, polyvinylchloride and polyethylene. Further applications may extend its operations to include the heat sealing of many of the resin-impregnated and coated cloths.

Heat-sealing agents

The two common types of heat-sealing agent are the lacquer type and the hot-melt type. On the first of these, temperature, pressure and time factors are very important because of the minute quantities of heat-sealing agent on the bag material. This quantity is so small that the slightest wrinkle in the bag seal will cause a "pipe" or leak through the seal. Some users maintain that jaw-type machines are better adapted for lacquer-coated films, while rotary-type sealers with preheating elements and cooling pressure belts do well on hot-melt coatings.

The heat seal on hot-melt coated bags and laminated

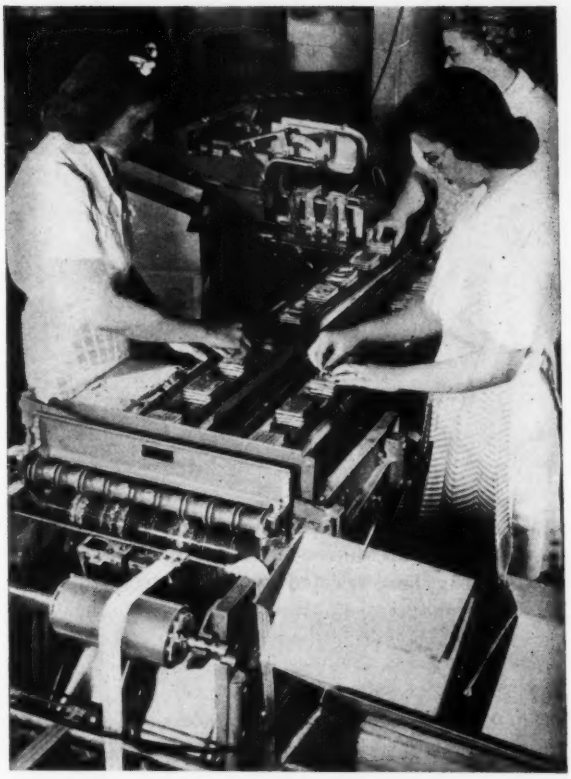
bags should be kept at least $^1/_8$ in. from the bag top, to prevent bleeding of the heat-sealing or laminating agents. The user of heat-sealed bags will find that his bag supplier is familiar with various types of heat-sealing machine and is generally in a position to recommend the type of sealer which should be used on the bag he supplies.

Temperature controls

Thermostats are generally used to control temperature on the sealing and preheat members. For reasons given above, sealing machines are furnished with excess heat capacity. This excess heat capacity causes temperature variations in spite of the thermostat. The thermostat cuts off the heat when the temperature reaches a certain point, but all of the heat which is in transit from the heating element to the sealing surface continues to that surface with the result that there is an over-run in temperature. This over-run depends on the mass of the sealing member and the rate at which it is being heated with relation to the rate at which the heat is used. For example, a bag-sealing machine may be furnished with enough heating capacity to heat the sealing members to 500 deg. F., but the particular material to be heat sealed requires only 250 deg. F. and the thermostat is set at that point. When 250 deg. F. is reached, the thermostat cuts out, but the heat in transit continues to rise so that an over-run of possibly 20–40 deg. may occur. A lag below 250 deg. F. will probably also occur for the same reason. Both the over-run and the lag will result in defective and improper seals.

The remedy for the above condition is to use a rheostat as well as a thermostat. These should be adjusted so that the thermostat turns on and off frequently. This is possible because the rheostat can be set to absorb the excess heat capacity. By this means it is possible to regulate the heat input so that it is only slightly more than the heat which is taken away by the bags when they are sealed.

A small signal light should be hooked in with the thermostat so that it will indicate when the current is on or off, which will act as an additional safeguard. A person adjusting the heat control can determine by test approximately how many seconds the light should be on and off and advise the machine operator to this effect. If the operator notices that the light is on or off for too long a period of time, the person who makes the adjustments can be notified. A sudden change in temperature may be due to a foreign substance on the sealing members, a variation in the electric current supply resulting from additional loads being thrown on, a window or door nearby being opened or closed, the room temperature being raised or lowered, the turning on or off of fans or blowers and many other causes. Despite the excellence of the heat controls in any machine, it is recommended that a check be made on the quality of the heat seals at regular intervals of no longer than 15 minutes.



2—Biscuits are wrapped in cellophane on this line by Miller Wrapping & Sealing Machine Co. Unit in the foreground cuts, delivers and overlaps the sheets. Unit in background folds and seals filled packets.

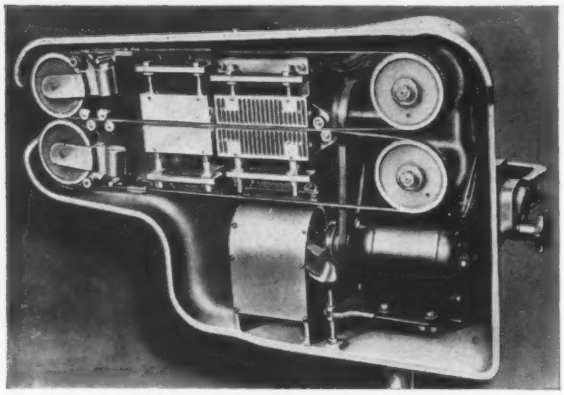
Pressure controls

All the sealing jaws or rollers must be clean, so that they permit the free passage of heat and allow intimate contacts with the bag being sealed.

Provisions for making pressure adjustments are provided in each sealing machine. As the machine parts wear, pressure will become less and this should be observed closely and checked at least once a week. The pressure on rotary sealers can be increased by inserting stronger springs. In the jaw-type sealers, the pressure may be increased by shimming one of the sealing jaws. When the time factor has been adjusted to its minimum, it is sometimes possible to increase production by having the operator seal two bags at once. Production can be increased by having the machine operator release the bag as soon as it is gripped by the sealing jaws. The operator can then use the dwell, or time that the heat or pressure is applied, to prepare the next bag for the sealing jaw. The machine should be positioned so that gravity will remove the sealed package from the machine without additional handling.

It should be noted that manually operated jaw-type sealers are not recommended for any critical packages. On such machines, the time and pressure factors are dependent upon the human element.

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3—Interior of Sav-Way unit adjustable for heat sealing many types of uncoated thermoplastic film.

Heat-seal crimps

Many people consider the indentation in heat seals to be there for a decorative effect and many packers of heat-seal bags have selected crimpings or configurations for appearance rather than utility. On a heat-seal package, these indentations are widely termed "crimps," with the result that many bag-sealing machines are called "crimpers."

The question of whether or not to crimp, the directions in which the crimp should run, the angle and pitch of the crimping teeth are all determined by the type of material being heat sealed and the ultimate result the crimping is supposed to accomplish.

As a general rule, flat jaws or rollers (that is, without crimping teeth) should be used on paper or cloth on which a heat-sealing coating has been applied. The paper or cloth generally resists the crimping action and has a tendency to flatten out when the heat and pressure are removed. If for any reason paper material has to be crimped, care should be taken to see that the crimps are so arranged that they will run parallel to the grain of the paper.

Cellulose materials are capable of being stretched under heat and pressure, and a crimp seal on such material is stronger than a flat seal. These materials will stand a fairly severe angle in the crimping teeth, a 90 deg. included angle being widely used.

Mounted heat-sealing foil can be crimped, provided the pitch of the teeth is not too coarse and the included angle of the teeth is not less than 130 degrees.

Laminated materials, other than cellulose sheets, should not be crimped, as their thickness is such that crimping does not reach surfaces to be heat sealed.

Crimping teeth are commonly cut in three directions. The first is called a vertical crimp and the crimps are parallel to the sides of the bag. The horizontal crimp runs across the top of the bag. The diagonal crimp is described by its name. The strongest seal is made by a vertical crimp, but this type of seal is not liquid-tight. The horizontal or diagonal crimp should be used where liquid tightness is a requirement.

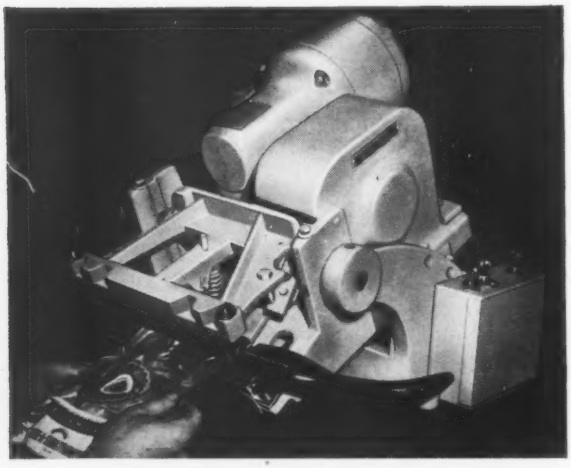
Ordinarily the width of a seal should not be greater than 1 in. and $^1/_2$–$^3/_4$ in. is usually wide enough. It should be remembered that in a given sealing machine, as the area of the seal is increased, the pressure per square inch is lessened.

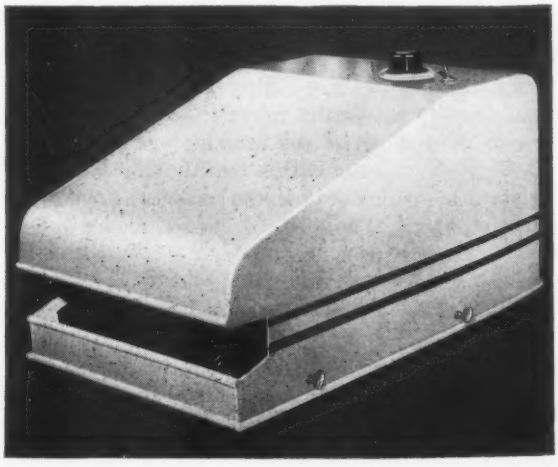
Factors in heat sealing

The question of whether to use a jaw-type or a rotary sealer is dependent largely upon the type of material to be sealed. A study of the factors necessary to make a good heat seal will help the selection of the proper type of machine. These factors, discussed in detail under *Heat-sealing Principles*, p. 558, are:

1. Temperature used
2. Time during which hot contact is maintained
3. Pressure with which the layers are held in direct contact

4—(Left) Jaw-type Wrapade heat sealer on a swivel base which may be adjusted for use at any angle on the line. 5—(Right) Removable enamel housing of this Wrapade unit is an advantage where cleanliness is essential.





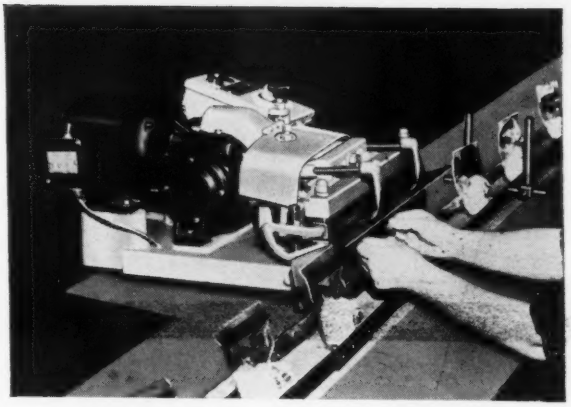
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Specific information regarding temperature control requirements for heat sealing a given material should be secured from the bag supplier—the data having been given to him by the fabricator who applied the heat-sealing agent to the film or sheet. Some materials heat seal at 140 deg. F., others as high as 500 deg. F. The job of heat sealing a given bag is made easy or difficult, depending upon what temperature variation can be permitted for the seal in question. The higher the sealing temperature and the greater the rate of heat consumption, the more difficult it is to hold a given temperature.

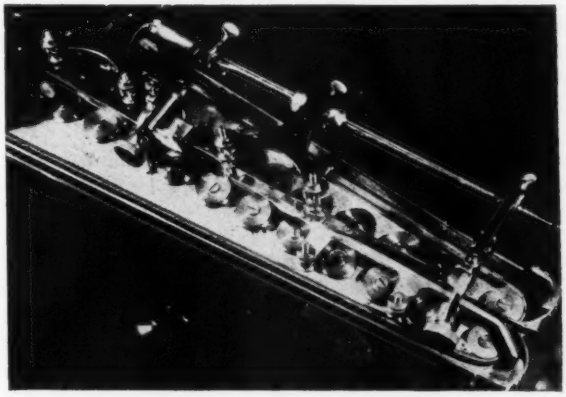
Laminated and multiwall bags play a large part in packaging today, and they suffer most from the application of improper sealing temperatures. It has been necessary to combine various kinds of material to make multiwall bags. The material in these bags may be laminated or not; some bags are composed of as many as 12 layers of material. This presents a problem to the heat sealer, because it is difficult to get a good heat seal on the innermost surfaces of the bag. This seal must be accomplished without injuring any of the other layers of bag material. Laminated bags offer a particularly difficult sealing problem, because most of the laminating agents have lower melting points than the sealing temperature of the heat-sealing film. For this reason, it is desirable to seal the bag at the lowest possible temperature. This may be accomplished by increasing the pressure factor somewhat and adjusting the time period so that the heat can pass through the several layers and bring about a heat seal on the innermost surfaces. An example of this is found in a bag which, when made singly, will heat seal at 200 deg. F. with the pressure applied for half a second. The same material made into a bag of three or four thicknesses should be heat sealed at the same temperature. However, this is not possible where production is a factor. It might be found that the time period required to seal the laminated bag at 200 deg. F. would be 10–20 seconds. Obviously this rate of speed would make the heat-sealing operation a bottleneck in production. It is therefore necessary to compromise and raise the temperature and decrease the time factor. The quality of this seal will depend upon the judgment of the person making the adjustment in the time-temperature-pressure relationship.

The user of a heat-sealing machine is naturally desirous of learning how to recognize a seal made at the proper temperature by its appearance. On opaque lacquer-coated materials, the sealed area must be pulled apart to be examined. If the seal is blistered or brittle or if the lacquer has been squeezed out of the seal to a smoky appearing area adjacent to the heat seal, the temperature was too high. On transparent materials, the above conditions can be observed without destroying the seal.

The presence or absence of a transparent heat-sealing lacquer on a given material is difficult to determine except in a laboratory. One supplier has recently tinted his heat-sealing agents so that their presence or absence can be determined. When a heat seal made on such material is pulled apart, the presence or absence of color in the heat-seal area enables the user to determine whether or not a bond has been made between the two surfaces. It is to be hoped that this or other methods of lacquer identification may be further developed because it is of considerable benefit to the user of heat-sealing materials. It should be pointed out here that in making a heat seal, the temperature of the heat-sealing agent should be raised to the point where the agent is plastic and not liquid. If the agent is brought to the liquid stage it may be squeezed out by the pressure factor or driven into the film on which it is based.



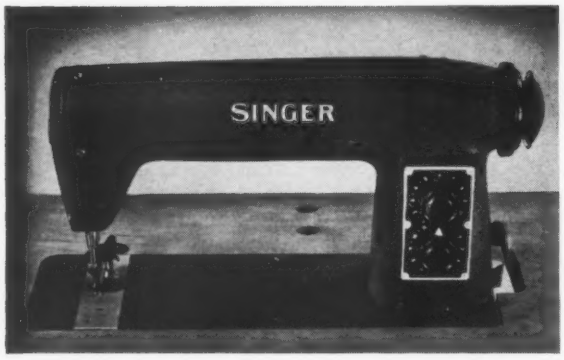
6—Adjustable for pressure and temperature, this Heat-Seal-It unit handles all heat-sealing materials.



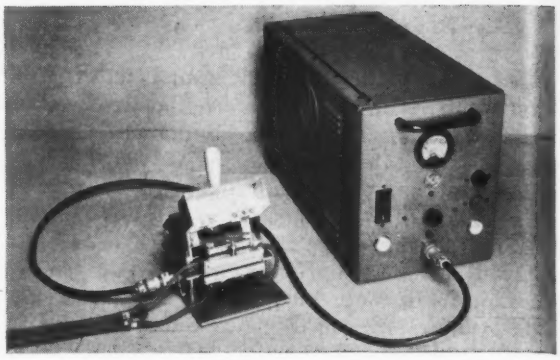
7—Mechanical rotary heat sealer designed for high speed by Amsco. Bags are hand-fed from a conveyor.

Lacquer-coated materials have a life which depends on their ability to hold the moisture which is part of their makeup. If they lose this moisture they become brittle and fragile. A heat seal made at too high a temperature drives the moisture from the material in the heat-seal area and accordingly shortens the life of the sealed bag.

The time factor limits the production pace of the



8—High-frequency heat sealing is performed on a newly designed unit by Singer Sewing Machine Co.



9—The small bar sealer in the foreground is operated by an RCA Victor electronic power generator.

bag-sealing operation. When additional production is desired there is a tendency to cut down the sealing time. It is important to note that the heat and pressure should be applied for as long a period of time as is compatible with production requirements. A test can be applied to see if the temperature is too high by momentarily increasing the time factor. If a damaged seal results as time is increased, it will be evident that excessive heat is being used.

The pressure factor is fairly easily controlled. The seal should be made with the least possible pressure, particularly in those instances where laminated materials are used.

Electronic sealing equipment

During the past decade, high-frequency generators have been used to apply heat to certain sealable materials. Generation of heat in the electronic way—that is, uniformly throughout the mass of the material—makes possible the "inside-out" temperature gradient that is ideal for heat sealing. This is achieved by the use of water-cooled electrodes which keep the outside surfaces cold while the interior is being heated to the fusion point. Pressure for welding may then be maintained without distorting the material and weakening it at the joint.

This principle contrasts with the ordinary heat-sealing method in that the latter operates by the penetration of the heat through the film. This means that the maximum heat is applied at the outer surface instead of where the two surfaces meet, and it diminishes as it approaches the interface. This calls for accurate control of the three factors in heat sealing—temperature, pressure and time.

Two methods of operation are possible: progressive sealing between rollers and "one-shot" sealing between formed or die electrodes.

In die sealing, one or both electrodes are formed to correspond in shape to the seam being made. This is usually $^1/_8$ in. wide and 4–60 in. long. The two sheets of material to be joined are placed between these electrodes and the material is heated by electronic power, under pressure, for 1–5 seconds. This operation has been successful with 0.004- to 0.008-in. thermoplastic sheet. Pressure is usually supplied by an air cylinder acting through an accurately guided push rod which maintains true parallelism between the moving and the fixed electrodes. Pressures of 5–50 p.s.i. on the electrode surfaces are required for this. Operating in the 30-mg. frequencies, 1–2 kw. equipment has been used for this work. However, large equipment may well be used to produce longer seams than any which have been made up to the present time.

One of the first electronic sealers was of the "sewing machine" type.[1] Recently, a somewhat similar sealer has been independently developed (Fig. 8). The machine will handle materials from 0.002 to 0.050 in. in gauge, forming a narrow continuous weld at speeds as high as 35 ft. per minute.

There is a continuous wheel feed, motor-driven, which leads the material between electrodes through which the high-frequency current, at 60 mg. is passed. This current is converted from ordinary 110-v AC current, into which the machine is plugged. A toggle-type of guide wheel, which carries no current, helps to guide the material.

By adjustment of the dials, the sealer can be changed to a slower rate of feed and greater power to handle thick materials. The machine will operate at this reduced feed as long as the pedal at right is held down; however, when the pedal is released, the machine will revert to normal feed.

There is one important restriction on the use of electronic sealing: it is effective only on dielectric materials. This includes nearly all plastic films useful in packaging and most materials with thermoplastic coatings. It is not effective, however, on metals or metal foils, even if coated with thermoplastic materials, since the metal is a conductor of electricity and interrupts the necessary high-frequency circuit. Electronic sealing is not successful with ordinary wax coatings, which appear simply to melt without fusing, but it is effective on wax compositions which have resinous modifiers, either thermoplastic or thermosetting.

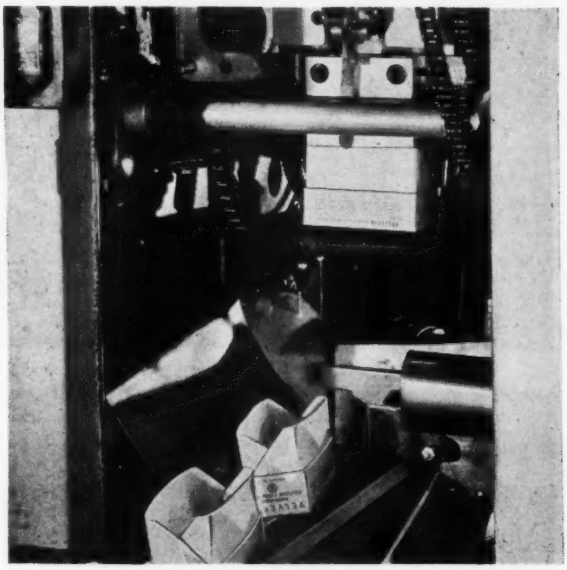
[1] See "Sealing by Electronics," MODERN PACKAGING XVI, No. 11 (July, 1943), p. 78.

Cartoning equipment

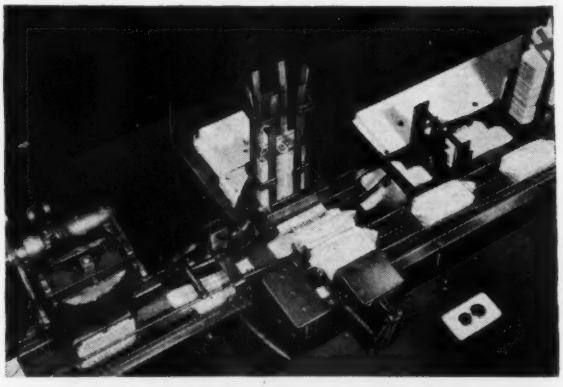
Generally speaking, cartoning machinery is equipment which performs the operations necessary to bring the carton from the collapsed, or "in the flat," state to the fully packed state. That is, it feeds the collapsed carton from a magazine, expands the carton, inserts a solid item (or a number of solid items) and closes the carton. Such machines also insert printed matter into the carton. The type of cartoning machine with which this article is concerned is rarely used in connection with dry, free-flowing items which must be weighed before insertion into the carton. Equipment appropriate for cartoning such products—coffee, dry cereals, etc.—is discussed under *Weighing and Filling Dry Products* (p. 708). The following paragraphs deal with machines suitable for cartoning various bottles and jars, razor blades, pies, chewing gum, tubes of tooth paste or shaving cream and many other miscellaneous items.

When to use cartoning equipment

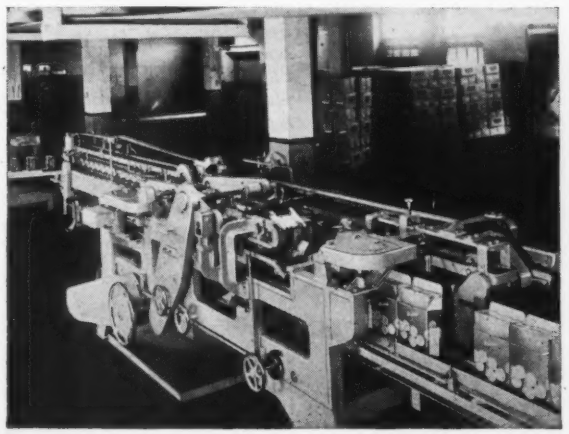
Whether or not a producer of cartoned products is warranted in planning for the use of cartoning machinery depends upon a number of factors. First, of course, there is the matter of the number of packages he is required to produce per day or week. Second, there is the nature of his package. Some cartoned products can be packaged quite economically by hand. Others, because of their more involved nature, are prohibitively expensive to package by hand. The best procedure involves submitting packages to carton machinery suppliers who can, after a study of all the fac-

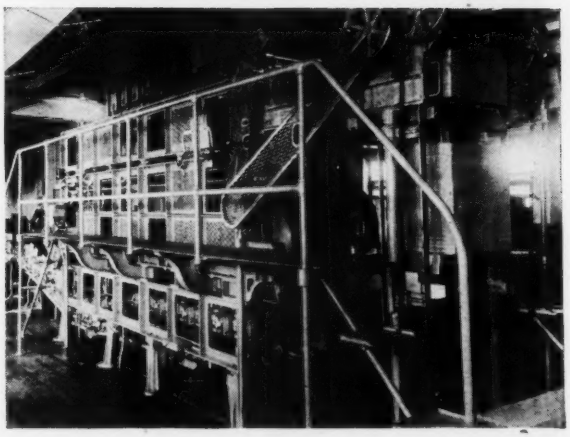


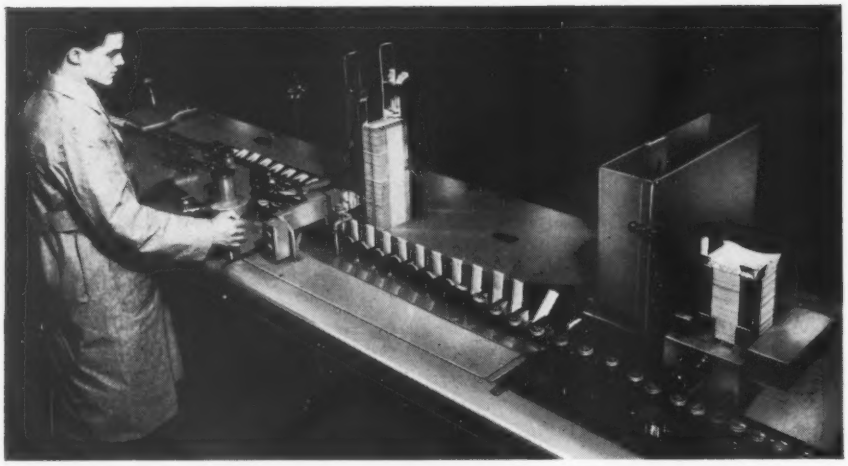
2—(Top) Line by Frank D. Palmer forms, fills, seals a 3-piece Kraft cheese package. Here bag is placed in carton top. (Below) Closure unit of same line.



1—(Below, right) Line by Battle Creek Bread Wrapping Machinery Co. forms, fills and closes cartons at Geo. Weston Biscuit Co. Here cartons are fed, lined, bottom-sealed. (Below, left) Closure end of this line: liners are rolled and carton tops sealed.

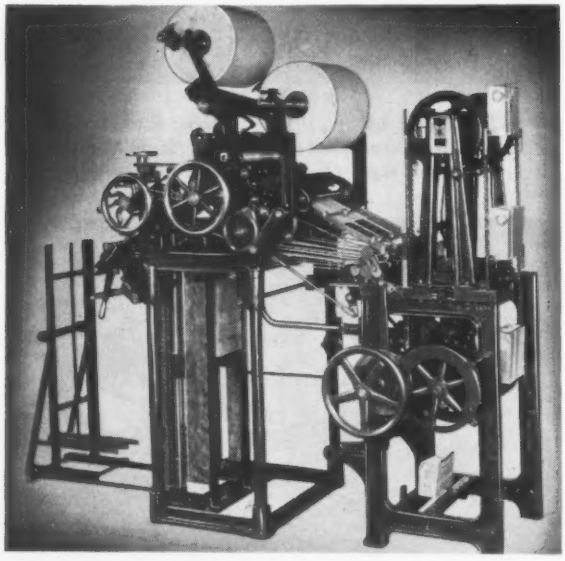






3—As many as 180 cartons per min. are handled on this R. A. Jones equipment. Here jars are received from labeler. They are loaded into carton together with an advertising leaflet and carton ends are tucked.

4—(Below) Cartons are formed and lined on this Peters unit which automatically sets up 55–60 Peters cartons per minute. Liners are cut from roll.

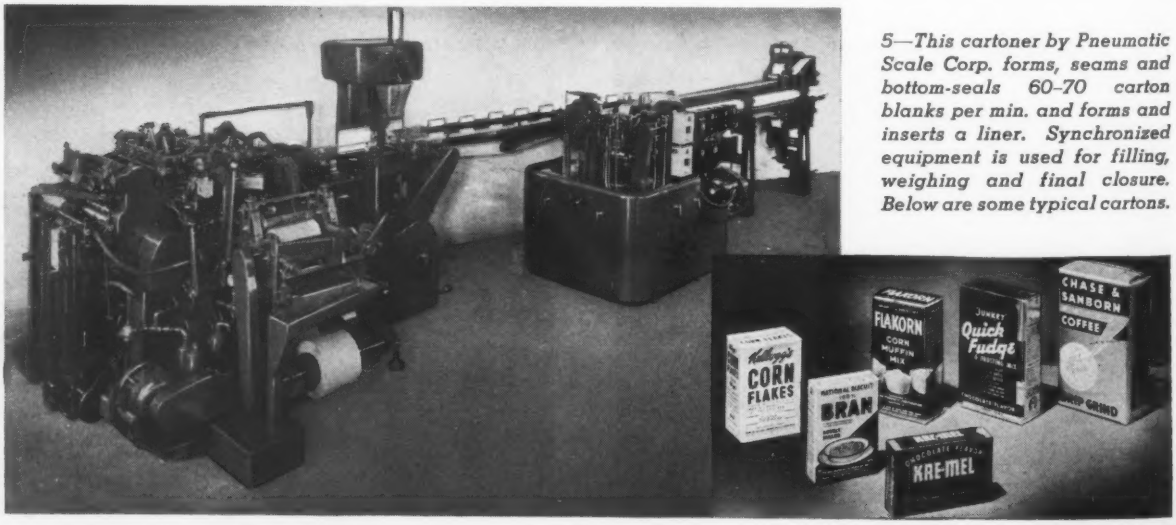


tors involved, either recommend an existing machine or advise concerning the modification of one of these cartoning machines to suit the requirements of the job at hand.

For packagers having limited packaging capacity requirements, high-speed cartoners have not heretofore been of much interest. However, if suitable provision is made for the other assembly equipment to build up a reserve, it may be profitable to use a cartoner even if it is in operation only for one-half or one-third of the time. In fact, cartoners can be employed even where the carton is used only seasonally, since they obviate the necessity for engaging greatly increased personnel for short periods to perform the cartoning operation by hand. The use of liquor cartoners at Christmas time is an example of such a seasonal application which is completely justified.

Types of carton

In general, two types of carton are handled by automatic cartoning machinery. Most commonly used is the tucked carton, equipped with top and bottom flaps



5—This cartoner by Pneumatic Scale Corp. forms, seams and bottom-seals 60–70 carton blanks per min. and forms and inserts a liner. Synchronized equipment is used for filling, weighing and final closure. Below are some typical cartons.

which are tucked into position by the fingers of the cartoning machine. The other type is the glue-end carton, used in cases where a tamperproof seal is desired or where the weight of the product would open the bottom tucks of the tucked type. In some cases, cartons have glued flaps at the bottom and tucks at the top.

A third type is the die-cut, but unglued, carton which is set up and closed automatically. This type is used for the packaging of crackers, lard, shortening and other similar products.

The range of cartoned products is tremendous. Packages of razor blades stand, perhaps, at the small end of the size scale. From this point, sizes range upward to the large cartons which are used for the packaging of macaroni or cleansing tissues.

Types of equipment

The efficient speeds at which cartoning machines now operate depend to a great extent upon the nature of the product to be handled and the size of the package. Several of the well-known packages of candy-coated chewing gum, containing 12 tablets, are automatically produced on machines that operate at speeds of 100–160 packages per minute. Safety razor blades are automatically counted out and cartoned at speeds as high as 240 packages per minute. Bars of soap and similar products are automatically cartoned by efficient machines at speeds which range up to 150 or more units per minute.

New machines of this type were developed to perform various war jobs, such as loading ammunition into standard boxes at high speeds and at a great saving in man-hours over the methods which had been formerly employed.

Some of these machines are finding application in cartoning civilian goods and their use will doubtless be expanded in the next few years.

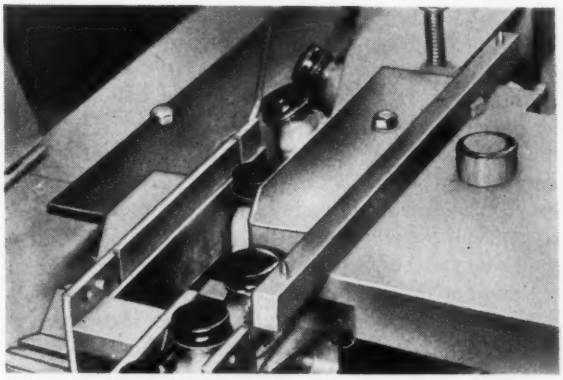
The semiautomatic or so-called "single automatic" cartoner takes the cartons in the flat from a magazine, sets them up and closes one end for hand loading and closing of the second end. This type is particularly useful where there are short runs of various sizes and shapes—for example, in the case of a long line of pharmaceutical products.

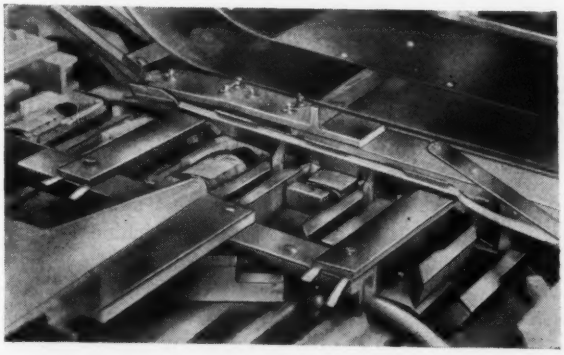
Fully automatic machines are available which eliminate all change parts. When they are used, size changes are effected by merely changing a few dial settings. Some automatic machines set up carton blanks and form and insert inner bags.

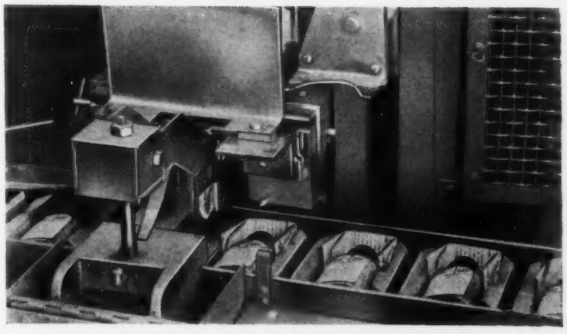
One type of cartoner can be geared down to relatively low speed in order to synchronize with other equipment on the line. The economy of using such equipment will be great if elements such as corrugated protecting liners, corks, spatulas, advertising or direction inserts and/or samples of another product must be included in the carton. Special accessories enabling the machine to perform these various operations must, of course, be provided.



6—(Above) Bottles of vitamins are cartoned at the Miles Laboratories on unit by F. B. Redington which feeds and folds leaflet and forms and loads cartons. Details below show, first, incoming bottles lowered to horizontal position for cartoning; second, folded leaflets placed over the bottles; third, bottles and leaflets eased into the formed cartons.







Wrapping equipment

Techniques for wrapping packages by machine fall into two general classifications—removable or loose wrapping, and wet or tight wrapping. Despite the increasing popularity of the latter method for certain types of products, removable wrapping serves many important purposes in present-day packaging. In this article, the discussion will be confined to methods and equipment for loose wrapping. (For a discussion of tight wrapping, see p. 745.)

When private brands for different customers are to be handled, plain cartons may be wrapped in printed materials or in unprinted wrappers with identifying labels. The loose wrappers can be held in place on the cartons by means of thin glue lines, applied automatically, which will prevent the wrappers from slipping from the cartons after they have been opened.

The loose wrap lends itself especially well to the insertion of a circular or premium between the box and the outer wrapper, or inclusion of a revenue or tax stamp where necessary, as in the case of cigarettes. Provisions have been made on many automatic wrapping machines to make the feeding of the circular from a magazine a part of the wrapping operation.

A great advantage of the loose wrap is, of course, that it can be used without a carton or other inner protective covering. For this reason, the loose wrap can be used for such items as individual pieces of candy, candy pops, chocolate bars, bread and cigars.

For the automatic wrapping of frozen foods, the loose wrap is necessary. Waxed paper or cellulose wrappers can be heat sealed and will withstand the low temperature conditions necessary in the packaging and preserving of frozen foods. Both of these materials are obtainable in printed roll form, and the electric eye can be used to register the printed panels as the package passes through the wrapping machine.

Other uses have also been found for carton and box wrapping machines. Automatic bundling of cartoned merchandise is a comparatively new development and is very popular with the manufacturer of such items as dime store toiletries, who is confronted with the problem of distributing his goods economically. The cost of paper wrappers is considerably less than that of boxboard containers and the fact that paper weighs less than boxboard will materially reduce costs incurred during shipping.

One new development, of particular interest because it meets certain package specifications for overseas shipments, is a double-wrapping machine which produces a securely sealed "package within a package" at the rate of 60–70 per minute. In this method, the double package is made up of a cut and scored carton blank and an inner liner of wax, parchment, glassine or a laminated film. The inner liner is fed from a roll, and is cut, formed, folded and sealed around rigid forming blocks, following which the carton blanks are folded around the blocks. The next step is the sealing of the sides and bottoms of the carton blanks.

Specialized wrapping machinery

The roster of recently developed equipment of a highly specialized nature includes machines for wrapping cakes of soap, bars and pieces of candy, cigars, packages of cigarettes, yeast cakes, fruit drops and many similar articles and packages. All of the popular types of wrapping material can be handled by these machines. Electric-eye registration makes possible the use of printed wrappers in roll form. The wrapping operation on these machines has also been improved to decrease the amount of wrapping material needed. Especially is this true in the confectionery trade for the wrapping of candy pops, where the use of a tight twist, heat-sealed wrapper has decreased by about 20 per cent the amount of wrapping material which is necessary for this purpose.

Machines are available to take candy in plastic form, shape it, cut it and wrap it, either with folds or with twisted ends, and speeds can be attained up to 500–600 pieces per minute. With twisted wrapping, the machines can be arranged so that the twisted ears can be colored and colored inserts can be put inside the wrappers. Old standbys, such as kisses or caramels, can be dressed up now and presented in a highly attractive and salable form.

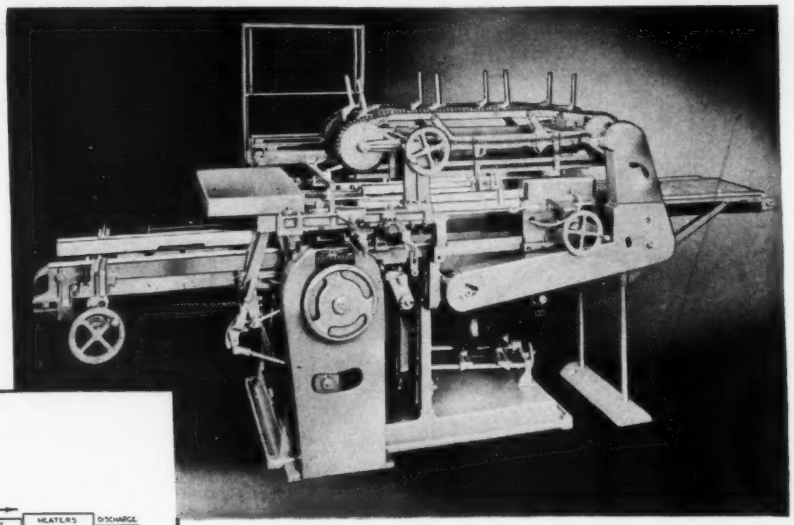
Wrapping baked goods

Wrapping in the bakery field has also assumed proportions of a highly specialized science. As in many other fields, there are several forms of producer-distributor organizations. The products, too, are varied. In some cases a fresh output is baked daily, while some products must be wrapped to withstand a shelf life of weeks.

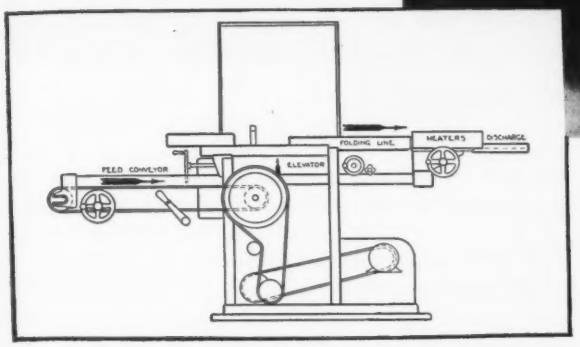
The development of automatic packaging machinery has without a doubt been a contributing factor, firstly in the growth of large bakery organizations with a wide distribution outlet, and secondly in supplying better, fresher and more sanitary products to the consumer at a lower cost. The large wholesale baker is likely to have a fully developed line of packages, printed or lithographed for identity and sales appeal. Such a baker is very much concerned with savings of packaging material which are made possible by the use of modern wrapping machinery.

Several manufacturers specialize in producing wrapping machinery for the baking industry, making both

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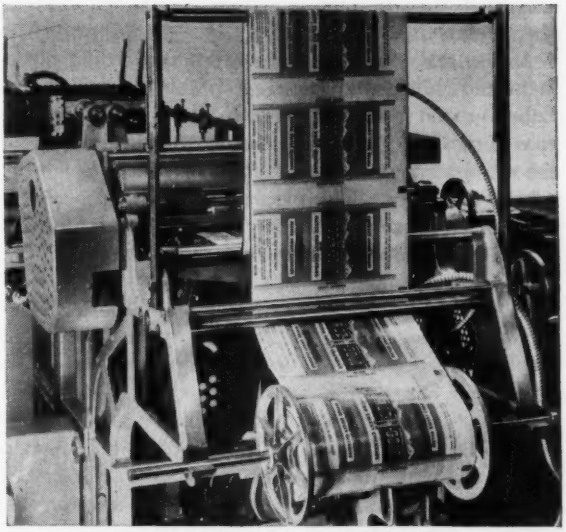


1—Popular wrapping equipment is the Package Machinery Co.'s model illustrated by all of the cuts on this page. It is adaptable for any type of wrapping material and can be quickly adjusted for size. The entire machine is shown at the right, while diagram below traces progress of packages through the parts. Other cuts show details and sample packages.



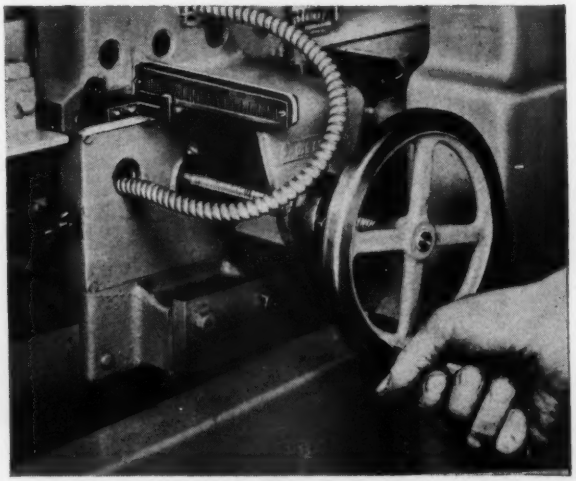
high-speed, single-purpose models and semiautomatic specialty wrappers.

The term "high speed," as used in the field of cake wrapping, is perhaps 50 units per minute. Some of these machines make use of an automatic card feeder. The cards are usually of stiff, odorless, unwaxed board 0.020–0.025 in. thick and rectangular in shape. They are fed into the machine automatically, thus leaving the operator's hands free to place the cake on the intermittent chain as it passes his station. The usual fold on these machines is the so-called single point "underfold" wherein the ends are brought neatly beneath and sealed against the supporting card. This type of machine is used principally for large production of "nickel cakes." Many varieties can be handled but the over-



Details of machine at top of page. (Above) Paper is tensed, registered by electric eye. (Below) Setting machine for size. (Left) Typical packages wrapped.





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2—High-speed Battle Creek cake wrapping machine installed at the Williams Bakery. Below are typical packages, irregular in shape, which may be wrapped on this machine.

all size of the card must be within the original limits of the machine.

A recent development is the automatic feeding, placement and gluing of labels of acceptable size and shape. Labels are fed from a magazine by the use of a vacuum, pass through a gluing mechanism and are pressed to the wrapping material just before it passes between the paper-feed rollers. This places the label in proper position on the package. Another device is one which applies a continuous printed band to the wrapper, the band being placed either on the inside or outside, running lengthwise. Bands may be of wax paper or heat-sealing cellulose.

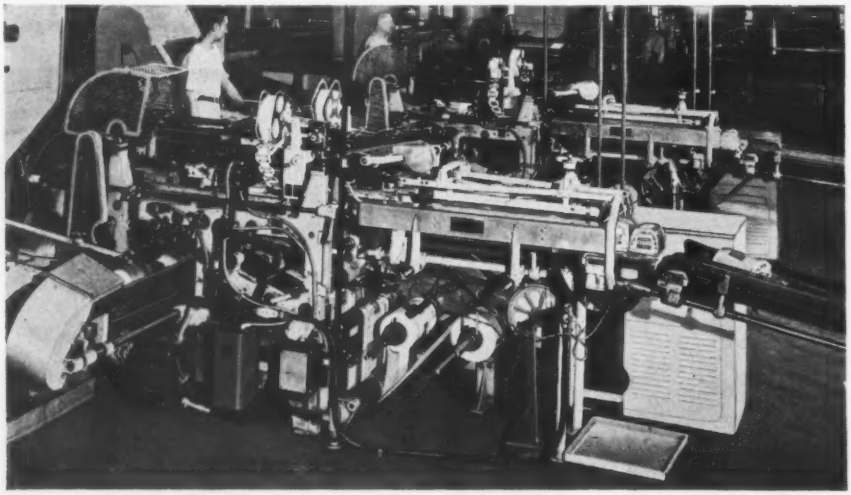
Other types of machine are adjustable for the wrapping of a variety of bakery products at high speed. They are capable of wrapping products 3–6 in. wide and 1–5 in. high. The speed range is 35–50 cakes per minute.

Semiautomatic machine types find application in the moderate-sized bakery where many types and sizes are handled. In many of these machines a variety of units can be wrapped without changing the size or shape of the container. In cases where a major size change is needed, this can be accomplished through the interchange of simple parts.

Wrapping irregular objects

During recent years, there has been progress in the wrapping of objects which are irregular in shape. Transparent film has been the favorite material, and it has been widely employed by cake bakeries, although textiles, garments, confections and other objects which can be carried on a cardboard support have also been so wrapped.

Obviously, any irregular object can be wrapped in an automatic machine if it is placed in a carton or in a four-sided tray. The other extreme is to wrap the object without a carton and without any cardboard support at all.



3—Battery of standard bread wrappers by American Machine and Foundry Co. They are equipped with attachments for applying end labels to loaves.



4—At the plant of Rockwell Barnes Co. are wrapped packages of paper and printed forms in a wide range of sizes. The equipment employed here comprises a Miller wrapping machine and a Corley-Miller Sheeter-Gluer. The latter can glue, cut and deliver sheets of kraft paper from rolls.

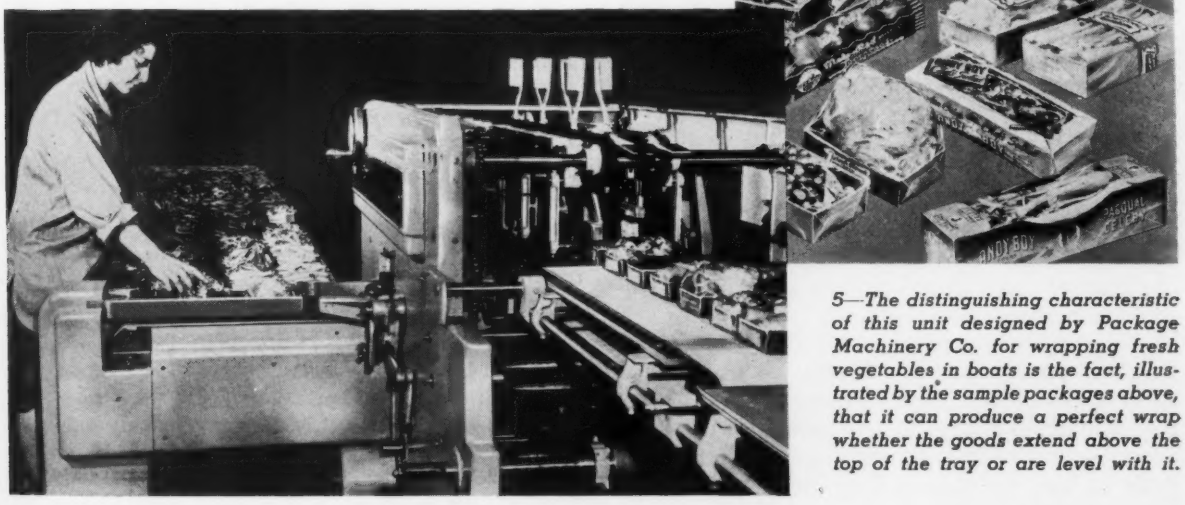
However, as alternatives, it is possible to use a scored flat card automatically shaped in a wrapping machine to form a U-board or to use a simple flat card without scoring or forming.

Sometimes, as in the case of such very delicate merchandise as iced cakes, pies, etc., the U-boards also give physical protection against crushing, and they also produce a surface against which end folds may be made.

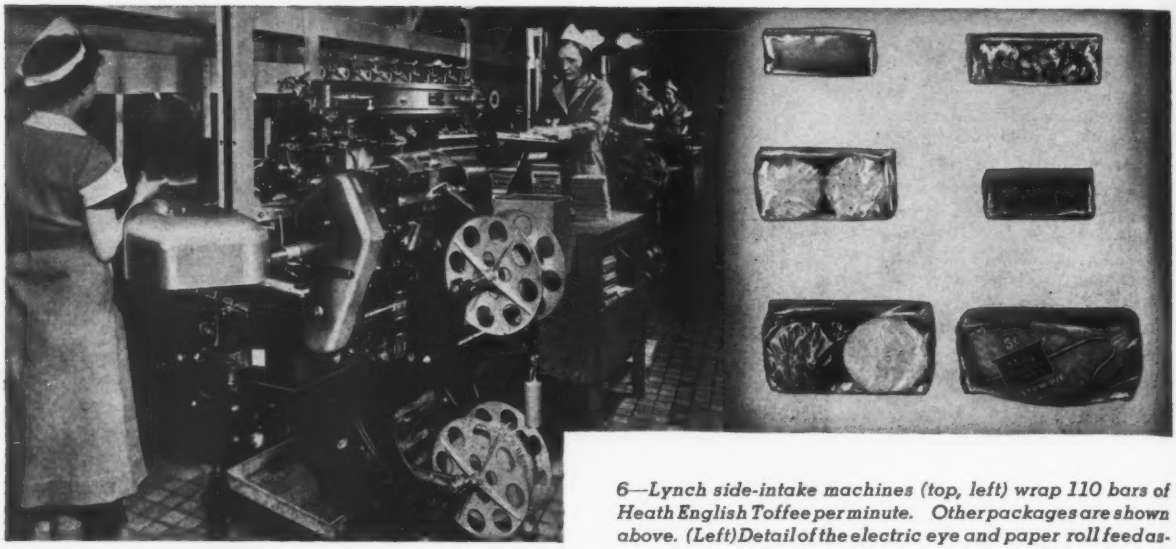
Underfolding on automatic wrapping machines has been developed primarily to assist in the wrapping of objects of irregular shape, or items which are so thin that an end fold cannot be produced practically. Machines are now on the market which will produce either end folds or underfolds with a very simple adjustment and without the addition or removal of extra parts. Almost any piece of merchandise coming within the maximum and minimum limits of the wrapping machine can be handled at a relatively high speed if it will rest in position on a simple cardboard support.

One method of wrapping individual pieces, articles or packages is with a machine which takes heat-sealing film from a roll, automatically forms a tube, and makes a longitudinal heat seal, hermetically sealing the article in the film. Two packages are made during each cycle of this machine which has duplex heads and can produce 60 complete packages per minute.

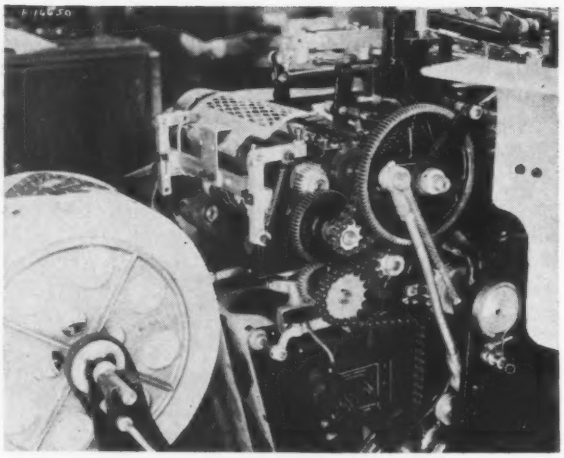
When printed film is used, the printing can be registered by means of a photoelectric registry attachment, or continuous printing can be employed for this purpose. An interesting method of registration em-



5—The distinguishing characteristic of this unit designed by Package Machinery Co. for wrapping fresh vegetables in boats is the fact, illustrated by the sample packages above, that it can produce a perfect wrap whether the goods extend above the top of the tray or are level with it.



6—Lynch side-intake machines (top, left) wrap 110 bars of Heath English Toffee per minute. Other packages are shown above. (Left) Detail of the electric eye and paper roll feed assembly on Lynch side-intake and straight-intake equipment.



ploys a miniature printing press, using quick-drying aniline ink and geared to the paper feed of the machine. The press prints material as it is being fed from the roll into the machine. With this press, registration is automatically taken care of, without the use of an electric eye.

Wrapping chewing gum

The use of strong wrapping materials has resulted in the development of easy-opening devices such as tabs, tapes and machine-made nicks to facilitate the opening of packages. Such devices are now being used extensively on small packaged goods.

The wrapping of chewing gum is receiving much attention at present because of the development of high-speed automatic wrapping machines. A machine is now available to wrap small individual sticks of gum at a speed in excess of 600 per minute. The machine will apply an inner wrapper fed from a roll and a printed band fed in sheet form. A thin strip of adhesive will glue the outer wrapper to the inner and prevent its slipping off the end of the stick. Individual sticks in regular sizes are being wrapped with an inner roll-fed wrapper and an outer printed label, at speeds up to 400 per minute.

The usual nickel package is being produced on single high-speed machines which can wrap the single sticks at 1000 per minute. The single stick has an inner wrapper of dry waxed paper or foil and a roll-fed label. Five of these single sticks are then assembled, and an outer, over-all, roll-fed wrapper, is applied.

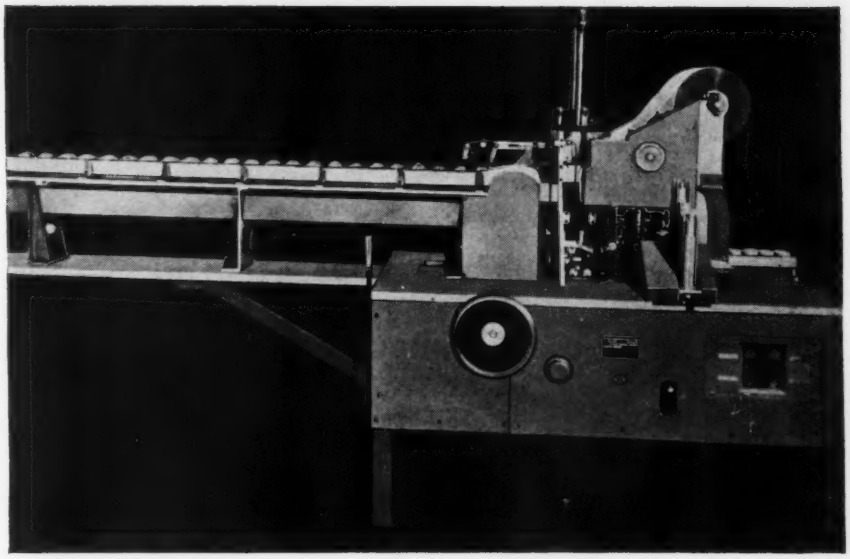
Automatic machines

In considering machine wrapping, three elements always enter the picture—speed, adjustability and price—and the three are intimately related. The more specialized the machine, the higher is possible production, and the more difficult it is to adjust it to a change in size of the object to be wrapped. At one extreme are the high-speed gum-wrapping machines mentioned above; at the other extreme are the carton-wrapping machines, based on the principle of bread wrappers. With the latter, a size change can be made in a few minutes.

Semiautomatic machines

Semiautomatic wrapping machines require a smaller investment and permit extreme flexibility with regard to size and nature of packages. Versatility of machines extends beyond mere adjustment range. It permits the wrapping of irregular, loose or stacked items or packages, because of close contact of the operator with the folding operation. The odd package can be guided by hand just enough to make allowance for its peculiarities. Examples in this category include packages composed of several loose pieces, for example, four bars of soap and a wash cloth wrapped together.

The semiautomatic machine will wrap with a variety



7—Cellophane wraps without cardboard or any other support are automatically applied to five-cent cracker sandwiches on this equipment by Wright's Automatic Machinery Co. The wraps are heat sealed and labels are applied and sealed to one or both ends of the package. Material is roll-fed.

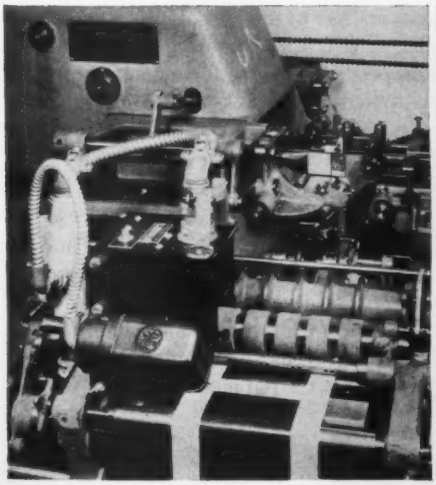
of materials, either heat- or glue-sealed, including heat-sealing cellophane, waxed papers, waxed foil and a wide range of materials such as plain transparent sheets, kraft and other ungummed and unwaxed papers. If a manufacturer of pharmaceuticals should desire first to wrap his packages individually in heat- or glue-sealing cellophane, then bundle them by dozens in kraft paper, the semiautomatic would perform both jobs, even laying glue on the kraft paper to seal it. Adjustability adapts semiautomatics to short runs.

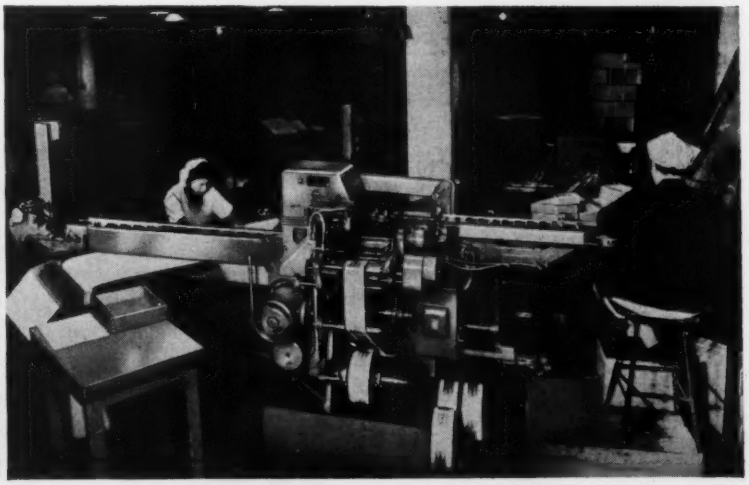
Speed of semiautomatic machines, while naturally less than that of fully automatic ones, is adequately high to exceed, by many times, that of hand wrapping or wrapping by means of simple fixtures and jigs. In some cases, particularly where frequent adjustment is required, or where great economies in wrapping materials are possible, the semiautomatic shows even greater savings than the automatic.

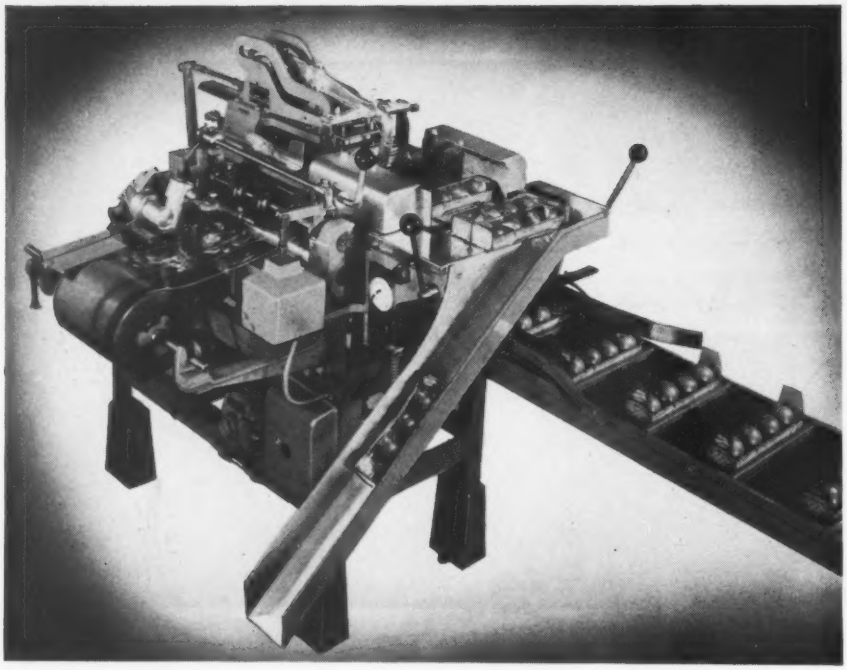
Packages produced on semiautomatic machines are uniformly neat and well sealed, whether with heat or glue. When packages are to be heat-sealed, the hot



8—(Right) Patties, cup cakes and candy bars wrapped by the Package Machinery Co.'s die-fold wrapping machine (below, right). Bars are transported automatically from enrober to wrapper and placed by operator in slots at infeed. Rest of process is automatic. (Below, left) Electric-eye register.







9—Overwraps of transparent, heat-sealing material are applied and sealed around trays of tomatoes by the Hayssen wrapping machine. Features are automatic flap tucking, take-off and unloading and thermostatic control of the sealing.

plates are kept under thermostatic control, so that there is no injury to either wrapper or packages. Packages containing heat-perishable goods, such as chocolate, butter, icings and frozen foods, can, if necessary, be passed quickly through the heat-seal region, so that a seal takes place, but the heat cannot penetrate far enough to be injurious. When glue is used for sealing purposes, the amount of flow and the area of application can also be positively controlled, so that results are unerringly the same. The machine user can have confidence in the uniformity of his product, in both appearance and protection afforded by the wrapper.

10—Irregularly shaped objects are wrapped in roll-fed sheeting with this Stokes & Smith semiautomatic.



Bottle wrapping is another achievement of the semiautomatic wrapping machine. Using many of the principles of the package wrapping machine to retain the valuable feature of adjustment for many sizes, this equipment also provides a clever means of neatly tapering the cellulose wrap from the shoulder to the cap of the bottle.

Ordinarily, the semiautomatic machine folds and seals the wrapper over the bottom and two ends of the package in the manner that an ordinary biscuit carton is usually wrapped. However, where a very shallow package is to be wrapped, where the ends do not offer sufficient depth for a satisfactory end seal, the end folds can be tucked under the ends of the package or underlapped. This feature is useful on flat packages, such as cake slices, sheets of writing paper and even extension-edged candy boxes, which are recessed at the sides and at the ends so that a conventional seal is apt to be entirely impractical.

The semiautomatic wrapping machine can also be furnished with a number of money-saving attachments, such as a coding device for perforating letters or numbers in the wrapper, or a device for attaching printed bands to the wrapper.

Hand-wrapping fixtures

Many simple and inexpensive tools aid hand operators in wrapping heat-sealing materials. These include various hot plates, upon which a package may be placed momentarily to achieve a seal. Where line seals or spot seals are desired, special heating irons, equipped with thermostatic controls and similar in appearance to soldering irons, are sometimes utilized. (For further data about equipment for heat sealing, see p. 730.)

Tight-wrapping equipment

When a carton is covered by the tight- or wet-wrapping method, the wrapper is glued to the carton and cannot be removed. This is in contrast to the type of wrapping described under *Wrapping Equipment*, p. 738.

In producing a tight-wrapped package, the plain unprinted carton is filled and sealed in the regular way by any one of a number of automatic and semiautomatic carton-filling and sealing machines which are on the market.

After the carton has been filled and sealed, it is fed into the tight-wrapping machine which automatically feeds the paper label, covers the blank side of the label with a thin coating of adhesive, and wraps it tightly around the filled carton, making a perfectly tight-sealed, nonsifting package—one which is also attractive. Various types of carton with inside bags or liners can be used with the tight-wrapped package, and different types of opening device may be employed to meet the specific needs of each product.



1—*The tight wrap protects a wide variety of foods in addition to cereals for which it was first used.*

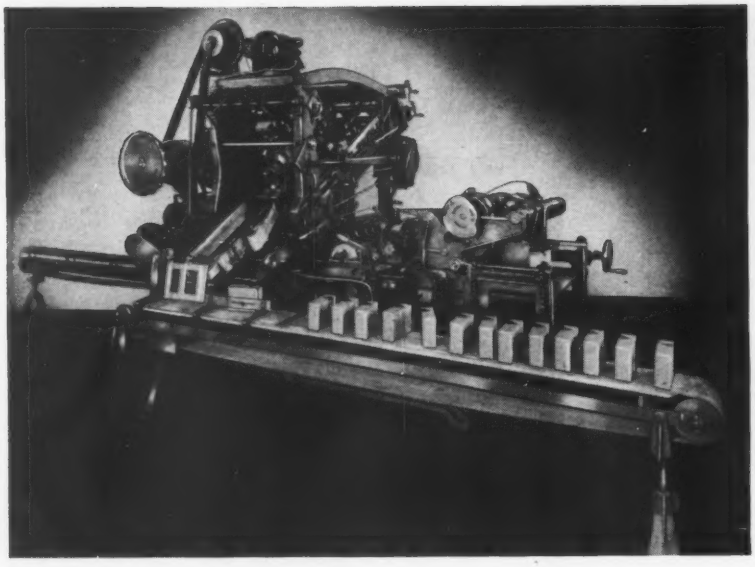
Types of tight wrap

Varnished wraps—The varnished label has been adopted by a number of packers and manufacturers employing the tight-wrapped package. Packages so wrapped are ideal containers for a wide variety of food and grocery products which are now being sold in the grocery stores.

A varnished surface makes the package attractive; the colors show up to advantage and the surface will



2—*This Stokes & Smith tight-wrapping equipment produces 60–70 packages per minute, is full-automatic, and handles a range of sizes and fold types.*





3—(Left) Printed wrappers in sheet or roll form are fully glued to all the carton surfaces on this unit by Pneumatic Scale. 4—(Right) Completed packages as they emerge from a Stokes & Smith tight-wrapping machine.

not accumulate dirt or dust as quickly as one which is not varnished. Also, this type of package is more moistureproof since the varnish provides an additional coating.

Metal-foil wraps—Another variation of the tight-wrapped package is the one wrapped with a metal-foil wrap. In this case, the label is made of metal foil laminated to paper so that the outside of the label is the printed metal foil and the inside is paper. The inside paper can then be glued to the carton in such a way that the label will adhere uniformly.

Waxed paper wraps—Another development combines the advantages of tight-wrapping and wax-wrapping at a low cost. This is accomplished by printing and waxing only one side of the sheet of paper, and gluing the underside to all four sides and top and bottom of the plain carton. This development has been made possible through the perfection of electric-eye methods of registration which permit roll-feeding of the printed and waxed stock.

Roll-feed and electric-eye registration can also be applied to regular unwaxed tight wrappers, an advantage worth considering because roll-printing is less expensive than printing in sheets.

Adhesives

Depending upon the requirements of the individual package, the range of choice in adhesives is wide. For packages tight-wrapped in ordinary paper, a cold vegetable dextrine adhesive soluble in water is used. For varnished and foil wraps, several kinds of moistureproof adhesives are on the market. Substitute adhesives which are made of latex are also available. (For more detailed information see the chapter on *Adhesives and Adhesive Tapes*, beginning on p. 541.)

Examples of tight-wrapped packages

Today the general utility of the tight wrap is recognized, and this technique is standard for many food and grocery lines.

For the tight wrapping of cartons, labels with various types of end folds can be used. Some are die-cut so that each end flap of the label is glued down separately. Others are rectangular, making a gusset fold on the end.

Many combinations of carton, liner and label may be used with this method, and their proper selection will ensure the product against damage in transport.

Cereal manufacturers were the first to adopt the tight-wrapped package, due to its specific utility in preventing weevil-infestation of package contents—a characteristic that is also of value in flour packages. Flour is packaged in the regular chipboard carton, which is then tight-wrapped. Some packers use a blue lining on the inside of the carton to give a whiter appearance to the flour.

In the salt industry, the tight-wrapped package is now being used by many of the leaders. One of the most satisfactory salt packages comprises a carton made of asphalt-lined board which is tight-wrapped on the outside.

For coffee, wax or parchment paper liners are generally used on the inside of the carton, and a tight wrap on the outside.

The tight-wrapped package has a special advantage for the packer or manufacturer who packs private-label brands for different customers. With the tight-wrapped package, he can use the same carton for many products, merely applying the appropriate labels for the different brands. This means a saving since it is not necessary to have a variety of printed cartons on hand to be used for the different brands.

Labeling machines and devices

So many factors enter into the problem of whether to label by hand or by machine that there is no agreement even among producers who handle similar containers in similar volumes. Among the factors entering into any decision are: the size and shape of the label, whether it is plain or embossed or made of varnished or lacquered paper or foil, the size and shape of the container, the number of labels applied to each container and the length of production run.

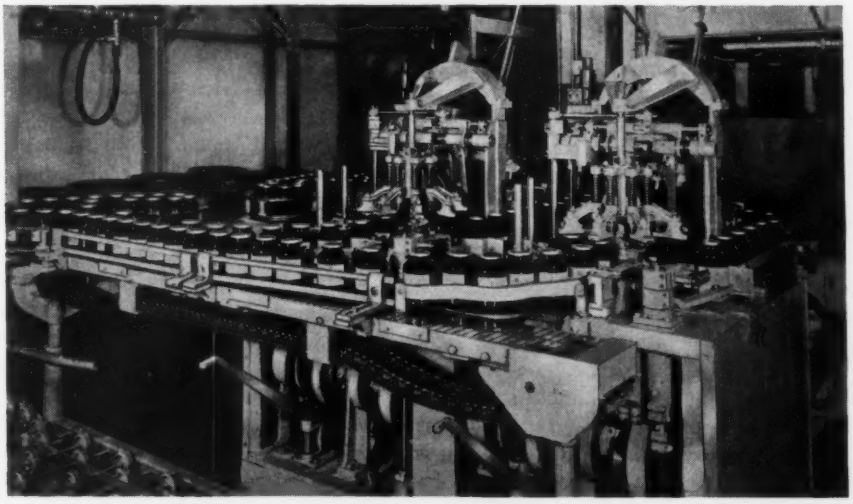
Hand labeling is flexible, but it does not justify retention of the "paste board." With the aid of inexpensive label gummers, the operation can be put on a factory basis. If the container is not cylindrical, one girl on a gummer can glue and spot-stick the label at the rate of 35–40 per min. as the container moves down a conveyor belt, and five girls can apply them neatly and rub them down. If a second label is to be applied, the containers may be turned over and the operation repeated. The alternative method, particularly applicable when two or more labels are applied, is for each operator to have her own label gummer and apply all labels. Label gummers of various types and sizes are available, and prove to be valuable in many ways.

Printing labels on gummed stock adds roughly 40 per cent to their cost. For hand labeling, however, this eliminates the gluing operation on label gummers, and the added cost is further offset if the size and shape of the container is such that it cannot be labeled as it moves down a conveyor belt but must be removed to a horse for labeling and then replaced. Gummed label moistening is best accomplished on a moistener fitted with inverted bristle brush. The device should be set so that the labels are drawn toward, rather than pushed away from, the operator. Gummed stock labels are more difficult to move into exact position than are freshly pasted ones, but, by the same token there is less tendency for unsightly glue smudges to ap pear on the containers.

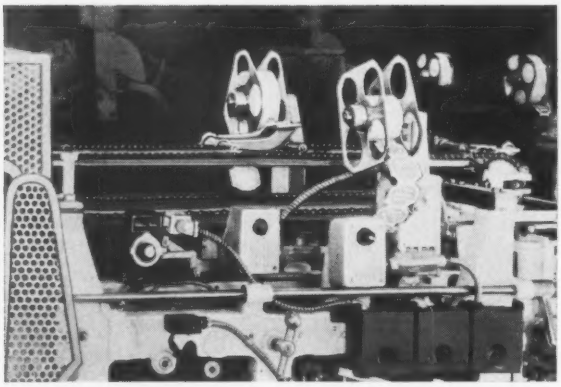
Where semiautomatic or fully automatic operations are to supersede hand labeling, intensive intelligent production planning should be employed. Long runs must replace short runs. Each line change involves the labor cost of the mechanical change-over. However, lost operators' time and lost production can be avoided by planning carefully so that such changes fall out of hours or during the luncheon period. Of even more consequence, the niceties of labeler adjustment are lost with each change, and efficiency is diminished until the new package is flowing through the labeler satisfactorily. Fully automatic labelers are rather complex mechanisms so that these considerations are even more important than with semiautomatic equipment.

Modern labeling machines vary considerably in capacity, but are basically designed for the following types of label-affixing methods:

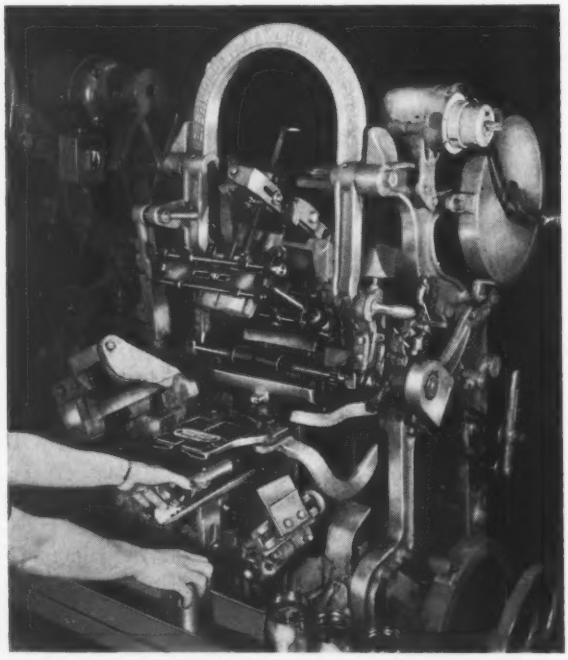
1. Adhesive is applied by a glue roll to "pickers" which carry the label from the label font or holder to the package. The label is held momentarily, but firmly, in place on the package by grip fingers while the pickers detach themselves from the label leaving a film of adhesive thereon, and pressure is applied either by flexible wipers or press wipers to obtain a smooth bond between label and package wall.
2. Adhesive is applied to a rubber pad which is brought into contact with the package. Next, the top label in the holder is brought into contact with the adhesive-covered area of the package, after which pressure is applied by wipers to smooth the label and to form the bond.



1—The twin turrets of this labeling equipment built by Economic Machinery Co. assure high production speeds. Here the line is installed for labeling jars in a food plant.



2—Detail of the end-labeling device on bread wrapping equipment by American Machine & Foundry Co.



3—Hand feeding is used with this Ermold semiautomatic labeler in the Ryan Peanut Products Co. plant.

3. The label is removed from the label holder by pneumatic means, passed over an opening where a spraying mechanism applies the adhesive, and the same pneumatic device then carries the label to the package and applies it. Pressure then effects the bond.
4. The label is removed from the hopper by means of a pneumatic platen which rigidly holds the label in a flat position and carries it tangentially over a twin-roller gumming mechanism where a uniform film of adhesive is rolled onto the label. By the same pneumatic platen, it is carried and attached to the article, after which pressure is applied to ensure firm, smooth adhesion.

Methods 1 and 4 are employed for semiautomatic or hand-fed machines while all four methods find application in automatic labelers. The semiautomatic or hand-fed labelers on the market are capable of speeds of 30–60 per min., dependent upon the size and shape both of the label and of the article to which it is affixed, and upon the efficiency of the operator. The latter factor may often be improved if periodic relief is provided for the operator and if there is a continuous flow of work to and from the labeler in such a way that stooping, lifting and reaching are minimized.

Some of the semiautomatic labelers are capable of applying two or more labels to the package simultaneously. These machines also apply the foil to the neck of the bottles used in the wine and soft drink industries. Such equipment will also handle articles too fragile to put through the faster automatic machines. One modified type, used for very small work, labels two articles at a time. The operator grasps one in each hand and inserts them, respectively, into two holders in the labeler. A throw-out device discharges them into a receptacle or onto a packing belt.

In addition to labeling containers, some semiautomatic models find wide application in the manufacture of greeting cards, calendars and photomounts, in the labeling of cigar boxes and wooden articles, for attaching of paper handles to drinking cups, and for applying certain transparent materials to folding-box windows.

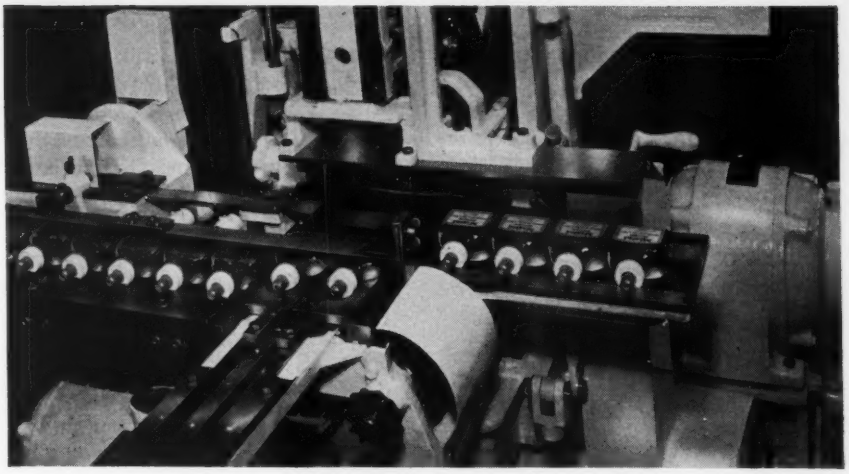
Automatic labelers can be segregated as follows:

The rotary type—This type employs either Method 1 or Method 4 for the application of the label and, as mentioned under the discussion of semiautomatic machines, it is also capable of applying two or more labels simultaneously as well as the foil neckband. Consequently, it is particularly adaptable wherever round jars or bottles, irrespective of size, are used, and where spotting of the label or labels with relation to the bottle mold seams is not important.

The bottles are taken from a conveyor by means of a star wheel or similar mechanism, are timed through the machine, and are then automatically ejected onto a conveyor for inspection, packing or storage. The speed range is 60–200 per minute.

The straight-line type—This is intermittent in operation whereas the rotary is continuous, and allows a wider latitude in the container shape, and greater accuracy in the spotting of the label. All four methods of labeling described above are used with these machines. Further, their design permits the affixing of front and back labels simultaneously at speeds up to 68–75 per minute. In the duplex models, which handle two containers at a time, speeds reach 120–126.

This type may be purchased with automatic rotating device, either electrical or mechanical, for spotting plain or decorated round jars or bottles so that labels are applied accurately in the area provided for the label and/or in proper relation to the mold seams. Many decorated round containers or those specially fitted with a groove in the bottom, can, by the use of suitable guide rails and hand rotation ahead of the infeed, be handled entirely satisfactorily.



4—Detail of a unit by New Jersey Machine Corp. employed for simultaneous labeling of two bottles. Machine is equipped with infeed conveyor and with bottle turnover guides.

The straight-line mulliple type—As its name implies, this machine labels a group of containers simultaneously, the capacity being determined by the number labeled simultaneously multiplied by the machine speed in cycles per minute. Available machines use the "picker" method for transferring and applying body, or body and neck labels to groups of four, six, eight or ten containers at a time for respective capacities of 80, 120, 160, or 200 per minute. They can apply body and foil, or body, neck and foil to groups of four, six or eight containers at 80, 120, or 160 per minute.

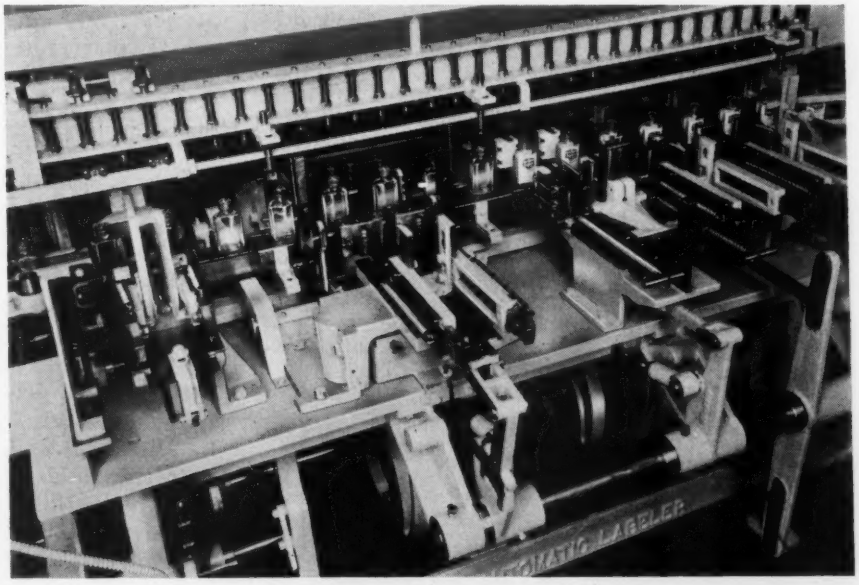
It might be asked why gangs should be handled intermittently when the trend is away from all machines intermittent in operation. The reason is that, in large production, a single labeler is required to synchronize with fast-moving, high-production fillers, cappers, cartoners, etc. In order to gum the label and to apply it properly an element of time is required, and even in the case of glue possessing high initial tack, the label should be held in place at least momentarily.

A full-automatic labeler for affixing Internal Revenue Bureau strip stamps to tobacco cans, and an even more specialized one for affixing IRB strip stamps to the necks of distilled spirits bottles are available.

Can labelers

The labeling of round cans presents a different problem since the label ordinarily used is of the "wrap around" type, the ends lapping over each other. For this purpose, semiautomatic and fully automatic labelers are available. The distinct difference between the semiautomatic and the automatic units is that the former cover the entire surface of the label with adhesive whereas the latter apply the adhesive in spots or in a narrow band to the can body and only to the overlap area of the label.

In the semiautomatic machine, the can as well as label is introduced manually and the labeled container is ejected by hand. Such machines are of small ca-



5—Duplex labeler designed by Pneumatic Scale Corp. is used to apply front labels only or front and back labels simultaneously at 120 per minute.



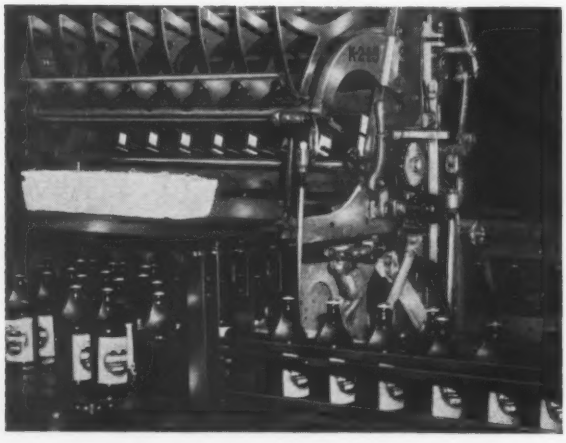
6—This Chisholm-Ryder labeler with an attachment for spot labeling is equipped to handle the wide range of cylindrical containers shown at the top.

pacity, handle many sizes and require no change parts.

The roll-through type is automatic except for the fact that it often is hand fed and that cans are sometimes hand packed into shipping cases with or without the aid of a case packer at the discharge end. The cans roll down a track for the application of "spots" of adhesive. These "spots," when the can passes over the label hopper, pick up the top label which then wraps around the rolling can. The label has a glue strip applied to the lap end which forms the closing joint. Speeds of 250 cans per min. are common, and speeds as high as 600 have been attained.

The can labeler is finding constantly wider application for the labeling of cylindrical bottles of all types

7—Discharge end of an Ermold automatic multiple labeler which handles as many as 10 bottles at once.



which utilize a wrap-around label. It is particularly applicable for short runs, since change-overs in size can be effected in only two minutes. Either hot or cold glue can be employed with some models. For best results, labels should be so made that the grain runs around the container.

Heat-seal labelers

Machines and appliances are available by means of which "heat-seal" or thermoplastic labels are applied. This recent development in labeling makes use of thermoplastic adhesives in such a manner that labels may be securely affixed to such soft surfaces as wrapped breads and cakes. In some cases, the individually cut labels are fed from a hopper in the familiar manner whereas other machines can apply and cut from a roll.

Selecting the proper unit

In choosing the type of labeler, certain essential points should be borne in mind, namely:

1. The type of container to be labeled and the present or foreseeable capacity required
2. The area and shape of the label, since small medallions and certain die-cut shapes and those nearly round are uneconomical or impractical to handle except on certain types of labeler
3. The material from which the label is made; plain, varnished or lacquered paper; paper-backed foil; metallic seals
4. Range of sizes economically handled
5. Ease of changing from one size or product to another
6. Cost of the complement of change parts and their simplicity
7. Control of the adhesive application
8. The cleanliness and accuracy of the labeling job
9. The manner in which the equipment will dovetail with the other equipment on the line

Handling the labels

In order to facilitate the use, on high-speed machines, of labels which have been difficult to handle:

1. Change the grain.
2. Leave labels in sheets and have them cut up just before use.
3. Store under controlled temperature of about 70 deg. F. and a controlled relative humidity of 50 per cent, determining, by trial and error, the best conditions for any given label.
4. Thoroughly work them up by hand just prior to putting them on the labeler.
5. Have the lithographer pebble labels made of heavy or silver paper stock, those which are heavily gilt, those having varnish or lacquer, and those labels which do not respond to one or more of the above treatments.

Code marking equipment

by Wm. A. Force III

Code marking of packages and labels is extensively used in many industries today. Although the purposes of code marking vary greatly according to the needs and desires of the packager, they fall mainly into the categories discussed in this article.

Indication of contents—One of the foremost uses of code marks is the indication of package contents. This may serve one of several purposes: to aid the manufacturer in assembly for shipment; to aid the retailer in supplying the customer with the proper merchandise; and, finally, for the information of the ultimate consumer in purchasing the article.

Routing—A second purpose of marking on packages is to assure proper routing. This type of marking is often used to identify lots of goods manufactured specially for a single customer, and each lot is coded to indicate its contents or destination. A closely allied use is the coding of certain categories of goods intended for specific types of sales outlet. For example, drugstores, department stores or mail order houses often sell the same goods, but different enclosures in the packages require accurate channeling of each item.

Dating—Another very widespread use of code marking is the indication of the date of manufacture. Typical of this use is the dating of photographic film to show the final date for effective use of the film. Many medicinals which deteriorate with time are dated to protect both the manufacturer and the consumer. Dating is also used to prevent the return of items for credit after a certain time limit has elapsed. Such dating is often in a hidden code to guard against abuse by unscrupulous customers.

Code marking is also used to identify the packer, the inspector or the packaging machine where the package originated. This marking serves to detect any error in packing or the quick location of any faulty batch of products. One happy result is a greater degree of responsibility on the part of operators.

Secret code marks serve to identify a product as the output of a certain manufacturer or outlet, thus preventing the return of goods purchased elsewhere.

Apparatus

In discussing the various methods of code marking, it is important to bear in mind three different types of apparatus which may be used. A careful analysis of each marking job from a mechanical labor-saving and expenditure standpoint will determine the proper choice.

Independent units—The code marking may be performed apart from the manufacturing or packaging operation on a separate machine which prints, perforates or numbers labels. Such units are available in more or less standard types from various printing, packaging and marking equipment manufacturers.

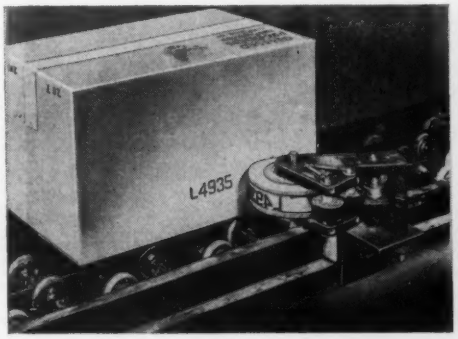
Attachments—Where speed and economy are factors, attachments fitting directly on labeling, packaging, wrapping or manufacturing apparatus are used. Thus no separate coding operation is necessary. When such attachments are used, no additional labor is ordinarily required to handle the code marking.

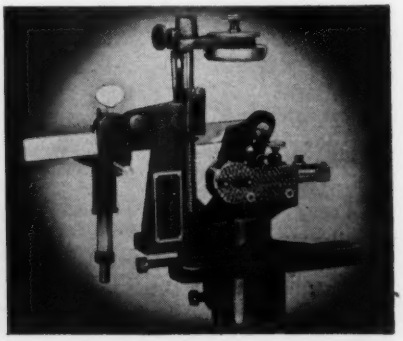
Hand devices—Where the type of product or the limited volume of output does not warrant the initial investment for a coding attachment or independent unit, it is possible to use a wide variety of hand numbering machines, code dating units and stamps of various kinds. However, such hand devices often involve a high marking cost per unit from the labor standpoint, and for this reason are not often used wherever the attachment or independent unit can be introduced.

Direct printing

As the name indicates, ink is used in the direct printing method and the code is printed directly on the package or label. One example of this type of marker is shown in Fig. 1. It fits directly on the conveyor and marks cases, drums and kegs. A spring loading attachment makes adjustments for slight variations in the location of the case on the conveyor.

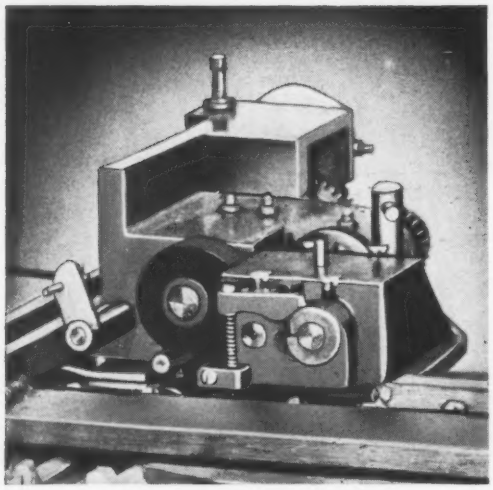
The unit illustrated in Fig. 2 is attached to a labeling machine and requires no attention in operation. It can be used to print digits or symbols on the front or

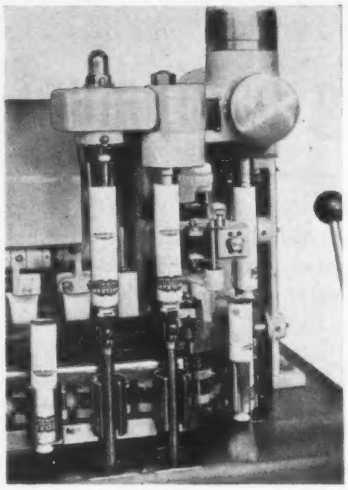




1—(Left) For direct printing of code dates on cases, crates and drums, this Rolacoder by Adolph Gottscho may be used. 2—(Right) Attached to a labeling machine, unit by Wm. A. Force & Co. prints digits or symbols on fronts or undersides of the labels.

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3—(Left) Many of the F. B. Redington cartoning machines are equipped with code dating mechanisms like this one. 4—(Right) Detail of Arenco tube sealer shows a coding device used for imprinting the folds of collapsible tubes with numbers or with letters.

the underside of labels as desired. A type holder or numbering head is equipped with interchangeable type or wheels so that the code may be varied as desired.

An independent unit labeler is shown in Fig. 8. This unit handles labels at rates as high as 250 per minute. It imprints a small legible number which may be located almost anywhere on the label. The machine is adjustable for different label sizes.

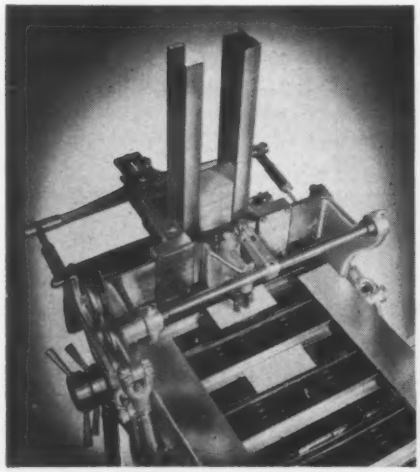
Still another variety of code printer is the device shown in Fig. 5. This device prints a date code on a card inserted in a transparent package for bread. The date can be read without removal of the wrapper. An automatic cardboard-feeding mechanism is used to feed and deposit a card in the ingoing conveyor of the wrapping machine. The bottom of the card is code dated, and five characters or numerals may be used. An inked roll is passed over a code holder in which the numerals or letters are inserted day by day. Pressure is used to force the code holder against the cardboard to pass the ink impression to the bottom of the cardboard. A block keeps the code holder in position against a stationary pair of fingers mounted on springs which cushion the physical impression of the block against the card. After being printed, the card is deposited in the ingoing conveyor flight and upon a loaf of bread which has been placed in the conveyor for overwrapping purposes.

Also included in the cateogry of direct printing is a wide variety of hand machines. As shown in Fig. 9, these may be ordinary rubber stamps, self-inking stamps, daters, figure and alphabet printers or hand numbering machines.

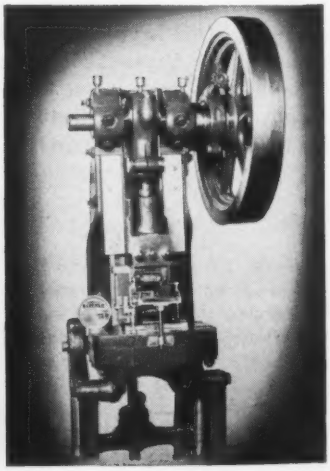
Perforation of labels

Instead of printing in ink, some manufacturers prefer to have a code perforated in the label or package. A typical application is the perforation of a cigarette package. One available machine punches holes in tinfoil to indicate the number of the operator, the day and the

5—(Left) Part of a Battle Creek bread wrapper, this device prints date codes on cards. 6—(Center) For permanent embossing, unit by Jas. H. Matthews is used. 7—(Right) Automatic embossing head, Wm. A. Force & Co.







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month. A set of 15 holes is arranged in three rows, thus:

. . . . .
. . . . . .
. . . . . .

By using all 15 holes, it is possible to obtain 32,767 different combinations. The holes are made by a set of 15 phonograph needles.

One of the difficulties encountered in perforation of code numbers on labels is that the labels tend to lock together when run through a labeling machine. In addition, the glue often passes through the openings, damaging the appearance of the label.

Embossing and debossing

Embossing and debossing of code marks is usually done on containers, tops of food and fruit cans, etc. A very ingenious device for this purpose is shown in Fig. 6. It is used primarily for permanent marking with embossed characters to show contents, date of manufacture and origin. While primarily used in the paint and varnish, chemical and food packing industries, it is adaptable wherever removable lids are used on metal cans.

Where serial numbering is used, a special automatic embossing head can be fitted to a power press in the production line. Such a head is constructed in two sections, male and female, and varies in specifications as to the type of material to be embossed.

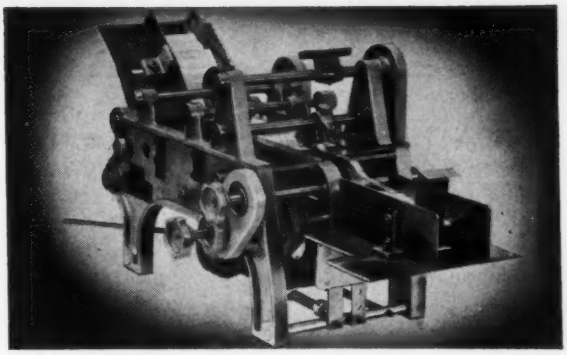
Numbering

As a matter of production control, numbering or indenting heads are often used to mark a number on each item packaged. In such cases, the numbers automatically change at each stroke of the numbering head so that each item will have an individual number. In other operations, a single number can be imprinted on all products for a day, week or month, or can be used to identify a single manufacturing run.

By intricate coding, numbers can be used to indicate the product, the identity of the workman or inspector responsible, the date of manufacture, the department or factory where the product originated.

Numbering is ordinarily accomplished by means of numbering heads which fit into hand or power presses. Some numbering heads are automatic, that is, they shift automatically to the next consecutive number (or skip numbers if desired) after each stroke (Fig. 7). Numbering heads may be adjusted to number in duplicate, in triplicate or to repeat. Less expensive heads require hand adjustments in order to shift the numbers and would be used for long runs of a single number.

To prevent fraud, it is often desirable to have hidden codes. One of the simpler methods of hidden coding is printing the number on the reverse side of the label. This method, however, offers considerable difficulties since labels are ordinarily fixed on the package with adhesive. It is effective on bottle labels, however,

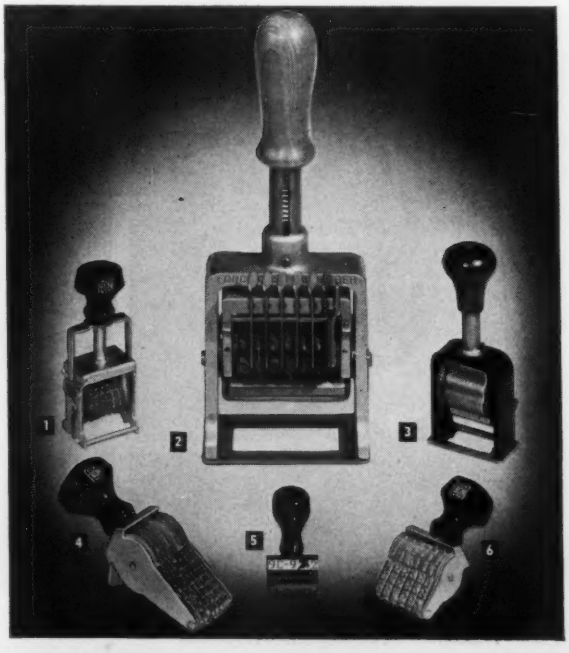


8—Independent unit labeler by New Jersey Machine Corp. prints numbers on labels at 250 per minute.

where the code can be read through the glass. Another technique, smacking somewhat of FBI methods, is the use of fluorescent ink which shows up only when illuminated by ultraviolet light.

Coding of merchandise as a protection to both manufacturer and consumer promises to be common practice in the near future. As summed up by Carl A. Claus in a speech before the Packaging Machinery Manufacturers Institute: "Manufacturers are experiencing the need for a stricter control of their product to assure the public of its quality guarantee. This is best achieved by coding or the numbering of a package, giving the date and place of manufacture."

9—Some typical hand devices for the direct printing of codes: (1) Self inker, Consolidated Stamp Co., (2) case coder, Wm. A. Force & Co., (3) hand numberer, Wm. A. Force & Co., (4) alphabet stamp, Krengle Mfg. Co., (5) rubber stamp, Marking Device Co., (6) line numberer stamp, Wm. A. Force.



Stapling and stitching equipment

by Fred I. Brown

The demand for speed and security in the sealing of bags and boxes gave great impetus to the use of stapling or stitching for this purpose in the years immediately preceding the war, and military needs of like nature enlisted large numbers of stapling machines and consumed vast quantities of staples. It is inevitable that reconverting manufacturers who seek the most efficient packaging methods, should use this type of equipment to prevent bottlenecks at the end of thousands of production lines.

Types of equipment

Many of the stapling machines already in use have been developed to such a high degree of efficiency that no design changes will be called for, although certain new developments are being engineered to speed up the operator's work. The stapling head is located beneath the work table and drives the staple upward against a small clincher arm, virtually eliminating obstructions to the operator's vision and movements in stapling thin, relatively flat shapes. Likewise, on bag staplers, locating a narrow clincher arm in front, with the stapler head behind the work, gives the same visibility and accessibility to this operation.

Numerous types of equipment adapt stapling to any type of operator and to any location within, or outside of, the plant. Electrically operated machines can be set up beside conveyors in the production line, or else small machines, carried in the hand, can staple the work wherever it happens to be most convenient to perform this operation.

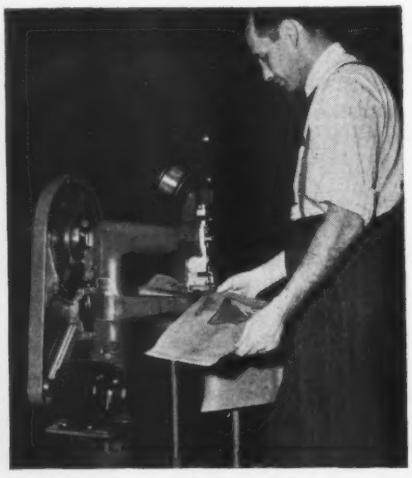
Inexpensive, small machines can be used where production is small or a low initial investment is desired. Larger, faster machines can be installed to meet larger production requirements, where the initial investment is justified by the results to be obtained. Many and varied models, falling within these classifications, are on the market.

For sealing small bags such as those used in packaging nuts or candy, nimble-fingered girls use light hand pliers, for light work and light schedules. For heavier work and continuous speed, foot- or motor-operated machines are used. On large multiwall bags, such as those used for fertilizer and asphalt, heavy-duty fasteners of the plier type, or foot- or motor-operated stapling machines are used. The type selected depends upon whether the machine is carried from bag to bag, or whether the bags travel to the machine for sealing. Sometimes the nature of the fold at the top of the bag calls for a foot- or motor-operated stapler with a slender sealing blade.

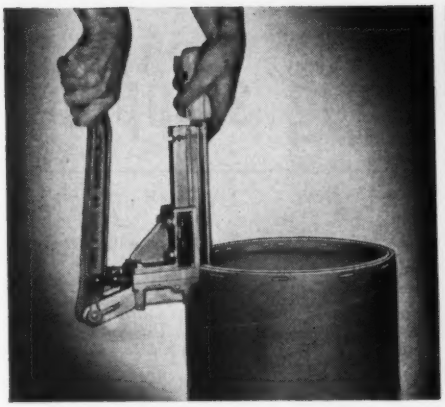
For sealing the bottom flaps of corrugated shipping containers, post staplers which may be operated by foot or motor, or power-driven wire stitchers with bottoming posts, are employed. The staplers use preformed staples cemented in strips. The stitchers, which are higher in initial cost, make their own staples from a coil of wire and are economical for maintaining continuous and uninterrupted production on a smoothly moving high-speed line.

For sealing the top flaps of corrugated containers, a foot- or motor-operated stapler or a stitcher, equipped with a sword-like sealing blade, may be used. The container is so manipulated that the blade is gradually withdrawn as the successive staples are driven. One hand machine which is widely used for this purpose employs no sealing blade whatever, but drives and closes the staple entirely from the outside of the container. The extreme portability of this machine permits the work to be done on a conveyor or at any place in the plant.





1—(Left) Staples are applied from both the top and the bottom of this equipment by International Staple & Machine Co. Electrical controls permit either unit to be operated independently. A belt conveyor may be had to control the speeds of the incoming cartons. 2—(Right) For volume production, wire-stitching equipment, like this Bostitch unit, is economical. Stitchers make their own staples from wire.





3—(Left) Stapling a fibre drum with a hand stapler by Acme Staple Co. 4—(Right) In many bag-sealing operations, small hand staplers like this one by Bostitch, Inc. are adequate.

Advantages

When containers are sealed with staples, they can be made up as needed. No temperature or humidity control is necessary to ensure effective sealing by this method—in fact, some concerns actually do their sealing inside of a refrigerator. If conditions are such that containers sometimes pick up more or less dust on the surface, this does not impair the staple seal. Moisture, which might loosen an adhesive, does not weaken the staple. Further, stapling does not obliterate advertising or other printing on the container itself.

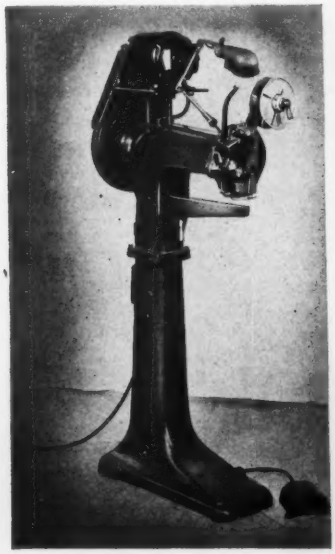
Salvage and re-use are also important factors for shuttle service between plants and between chain store packaging plants and their retail outlets. The staples can be quickly and cleanly removed with a simple staple remover and the flattened containers can be returned to the shipper for frequent re-use.

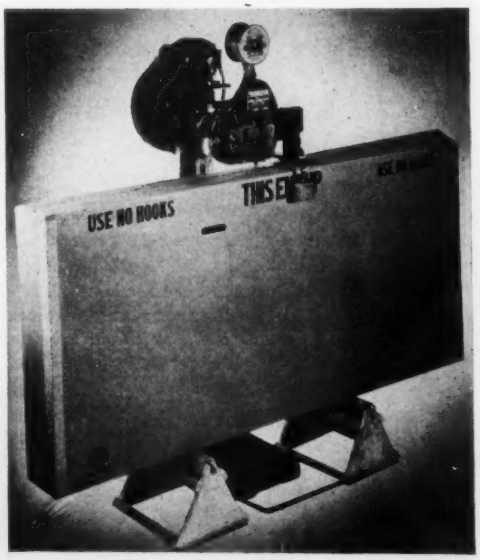
The use of stapling in carding small items of merchandise for display purposes is beginning to attain its previous proportions with the gradual easing of limitations on production. Articles too small in themselves to possess sufficient attention-getting power or to carry adequate sales information are stapled to cards which present the message to the consumer. Such cards serve to identify the brand and the manufacturer, to convey a selling message that the article itself is too small to carry and the salesperson too busy to tell, to carry directions and explanations that ensure the proper use and care of the product, etc. In addition, pilferage is discouraged if not eliminated.

Practically any item that can be embraced by a staple can be carded in this way. Bottles or other fragile merchandise can be safely and quickly handled, because the pressure of the stapling machine can be accurately controlled without variation, and the staple can be firmly clinched with no appreciable pressure whatever on the object being enclosed.

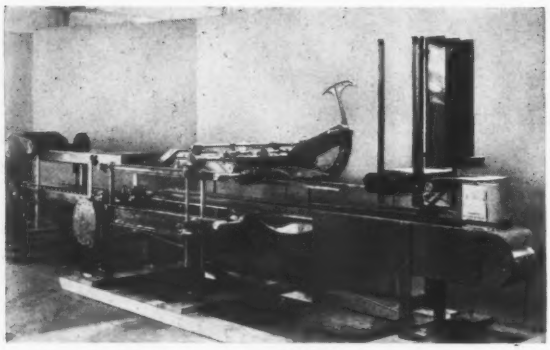
5—(Left) Stitcher, by Acme Steel Co., for sealing heavy-duty multiwall paper bags. 6—(Center) Bliss box-stitching machine manufactured by Dexter Folder Co. is equipped with horizontal clinching arm. 7—(Right) Adaptable unit by Harris-Seybold Co. for stitching large and irregularly shaped containers.







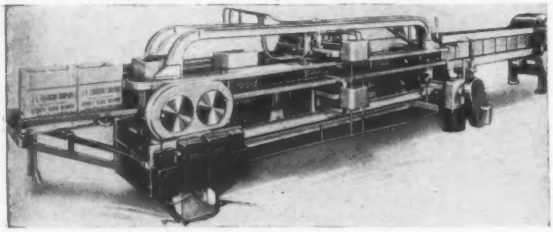
Packing and closing shipping containers



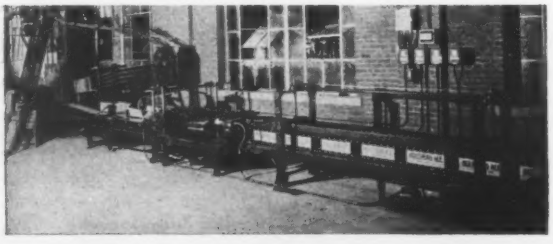
1—For the fully automatic packing of cases, this machine by J. L. Ferguson Co. is equipped with a compression unit, glues tops and bottoms of cases.



2—Cans are loaded into cases with this equipment by Burt Machine Co. The cans are fed horizontally.



3—(Above) Automatic case sealer by J. L. Ferguson.
4—(Below) Cases of beer cans are packed and sealed here on machinery built by Standard-Knapp Corp.



Even in well-equipped and efficient plants, shipping containers are too frequently packed by hand. There is little reason today for such completely outmoded practice.

Fully automatic machines are available for packing groups of individual packages into multiple-unit cartons or into display containers, and tucking or sealing the containers at the rate of 25 complete units per minute. Other equipment is available for bundling and for packing and sealing shipping cases. In addition to the devices described below, stapling and stitching is a widely employed method of closing the shipping containers. (For information about such devices, see *Stapling and Stitching Equipment*, p. 754.)

Bundling equipment

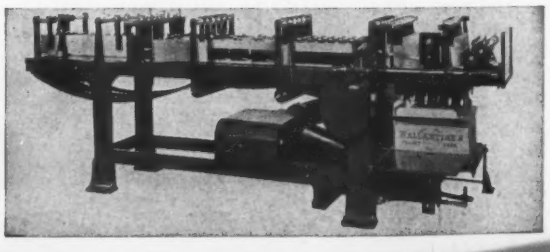
Bundling equipment is of importance both to packagers who look to the buyer to pay the freight charges and to manufacturers who defray the delivery charges themselves. The savings are twofold: on the interior multiple-unit container cost and, due to reduced tare weight, there can be considerable savings on the overall delivery cost.

When bundling equipment is used, the packages flow to the feed conveyor of the bundling machine instead of being placed by hand into boxboard or fibreboard containers.

The bundling machine counts off the unit number and automatically wraps the bundle, usually in strong kraft paper. It then seals the seams and applies descriptive or decorative end seals to the finished bundle if they are desired.

One type of bundler has a single-feed conveyor while another is equipped with two or three infeed conveyors which are arranged one above the other. The conveyors on the latter type bring the individual cartons together at the wrapping mechanism. When one dozen units are being packed, the bundles are made up in two tiers of six packages or three tiers of four packages each.

5—Beer bottles are loaded into cases with equipment like this Standard-Knapp machine. The conveyor delivers bottles to grid which positions them.



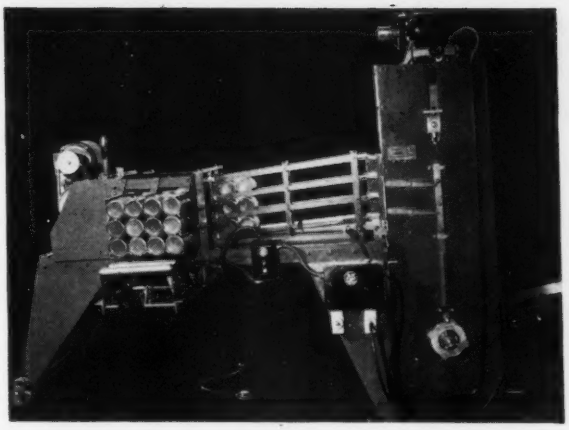
XUM

Case packing equipment

Equipment for the case packing of cylindrical cans consists essentially of a series of inclined runways which receive and gather cans as they roll off the conveyor lines. When the proper number of cans have been assembled to fill one layer in the shipping container, the cans are pushed, horizontally, into the container by a hand- or electrically-operated device. If the container is of a type which accepts more than one layer of cans, this operation is repeated. Care should be taken in all cases to avoid scuffing the labels on the cans while packing them.

Bottle-casing units work on a similar principle, but due to the partitions in the case, use a vertical drop rather than a horizontal push, to effect entry of the packages into the shipping container. Bottles come off the conveyor lines and are gathered over a grid which correctly positions them. At the proper moment, and under the control of the operator, the bottles drop into the shipping container which has been automatically raised to a point where it will rest just under the grid.

Carton packers have been developed which operate on principles very similar to those of the can packer except that the rolling action of the can is replaced by a pushing action to get the rectangular cartons into the proper position.



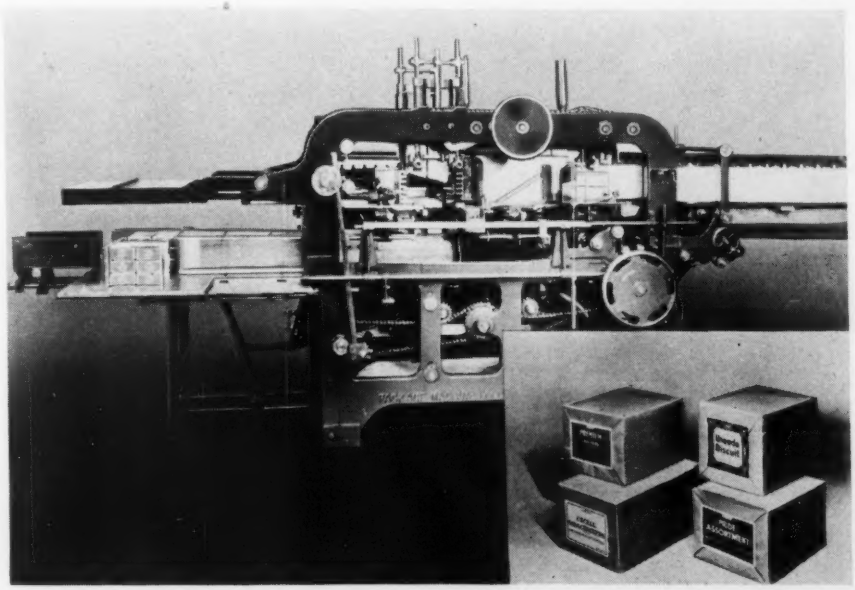
6—Two tiers of cans may be loaded simultaneously with this Chisholm-Ryder case packer. The can delivery may be from the right or from the left, or from both. A special type of elevator is used.

Case sealing equipment

Once packages have been packed—by hand or by machine—it becomes necessary to seal them firmly for shipment. The simplest devices for this purpose are the hand glue sealers, which are merely adjustable pressure units mounted on top of roller conveyor sections through which the hand-glued cases are passed for purposes of sealing.

Case-gluing and sealing units of an automatic type can receive filled, but unglued, cases directly from the conveyor line and apply adhesives to both the top and bottom flaps of the cartons. They then fold the flaps into closed position and pass the sealed containers through a compression unit, where the glue sets. Speeds of 200–1200 cases per hour are practical on such automatic equipment. Machines may be equipped to seal and glue top flaps only, as in the case of reshippers for bottled goods which have been used to carry the bottles from the glass plant to the plant where they are packaged.

The machines are completely automatic, require no operators and are adjusted to start in motion whenever a case is presented by the conveyor line. Many machines are equipped with photoelectric cell devices to prevent jamming of cases.



7—Bundling machine designed by Package Machinery Co. This equipment automatically stacks cartons in tiers of one, two or three or more, wraps them in kraft paper and attaches printed end-seals. Typical bundles are shown in insert.

XUM

Materials-handling equipment

In general, packaging plants fall into two categories: those in which materials handling is a neglected art and those in which it is a highly developed science with attendant labor economy, reduction in production delays, increase in plant capacity and increase in convenience. In addition, proper handling equipment definitely contributes to neatness and orderliness.

It is axiomatic that every plant must have a place for the storage of materials and findings, as well as space in which the processing and the packaging operations are performed. In each plant, too, provision must be made for the movement of the materials to and from processing, packaging and storage places. As suggested under *Fundamentals of Packaging Plant Layout* (p. 703), no one type of equipment will serve all purposes and it is folly to attempt to make it do so. Accordingly, any given physical plant may require everything from wheel trucks and lift trucks to conveyors of the gravity, portable, live roll or belt types. Monorails, fork trucks, articulated fork trucks and pallets may also be required.

Furthermore, even in the relatively standardized liquor packaging industry, for example, differences in the physical plant demand dissimilar materials-handling equipment. The problem, then, should be tackled not with fear and trembling but with determination to find the optimum way for performing every operation and the most effective method of combining operations in a smooth sequence.

Economies in handling materials

Materials-handling equipment may well be chosen for operational savings rather than on the basis of first cost. After installation, these units should be given the same maintenance attention as the finest packaging equipment in order to ensure long life and satisfactory service.

Reduced handling—The greatest economy in handling materials is secured by *not* handling them. For example, an elaborate live roller conveying system was installed in one plant. It was hundreds of feet long, complete with lightweight portable conveyors to facilitate stacking in a receiving room having a capacity of 90,000 reshipper cases. Shortly thereafter, the spiral chutes to the assembly room on the floor below were replaced by long overhead gravity conveyors pitched in direction opposite to the production line flow, and the case storage system was no longer required. With the old system, it had been necessary to feed the chutes continuously, but the new long gravity conveyors acted as reservoirs for 90–115 cases each. Thus the empty ware in reshippers could be fed in "trains" at intervals direct from incoming cars and trucks. By more thorough scheduling of purchases and delivery, fully 75 per cent of incoming containers flow directly to the automatic and semiautomatic production lines. Since the overhead gravity conveyors do not touch the receiving floor, the two handlings were eliminated, only



1—Conveyors are used at all stages of the packaging operation. In this basement, empty cartons are prepared for filling. They are transported to the packaging line by special Lamson 45-deg. boosters having two slide belts adjustable to suit various cartons.

a small inactive floor stock was needed for emergency, and receiving costs were down over 30 per cent.

Shortened distance—Another economy in initial outlay, depreciation and maintenance is to shorten up handling and transportation as much as practicable. For instance, in a bottling plant the cleaner, filler, capper and labeler can be set closer together if they are synchronized. Instead of having four chain conveyors, each handling the work through the respective machines, one chain conveyor runs throughout all four, and dead plates, transfer disks, etc., are eliminated.

Further, as any production line becomes more fully automatic, there are fewer hand operations. Therefore, shorter belt conveyors and, frequently, narrower ones can be used to carry the packages past operators. If more than one operator performs each of the hand operations, then the packages should be split into trains at each side of the belt and operators should be stationed on each side. This often permits further shortening of the line.

Simplified installation—The simplest installation possible is always the best solution to any problem. To attain it may involve rearrangement of one or more departments, or it may even require picking up and moving a department bodily to another, more convenient and logical location. That should not deter or defer action, however.

In receiving and shipping, many systems stop at the car or truck door or even the dock. Portable conveyors which utilize roller skate rolls instead of regular conveyor rollers to keep weight down in 90-deg. curves, and which have 3-, 6- and 10-ft. sections, have proved invaluable. For incoming goods, the live roller or belt conveyor should be mounted low enough to allow gravity feed of the portables from the very ends of cars and fronts of trucks and trailers. For outgoing merchandise, the conveyors or boosters should be high enough to allow gravity flow on the portables. If extension cords for lights in cars and trucks are desirable, then extension conveyor control switches for starting and stopping are indispensable.

Conveyors

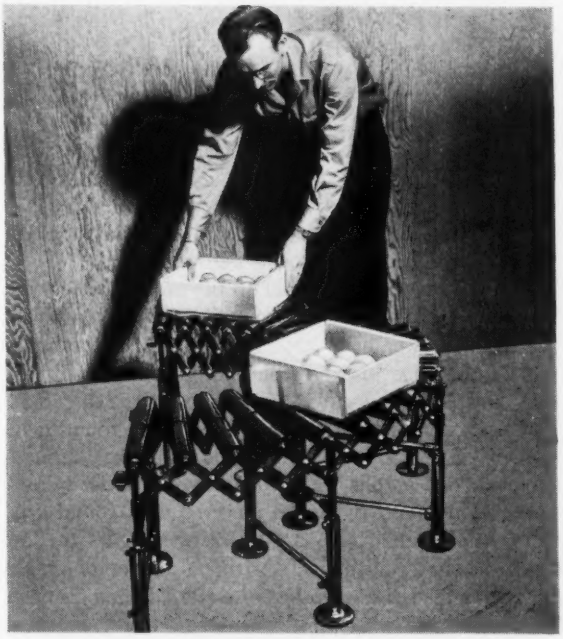
The eight standard conveyor types employed to provide a complete handling system are described below.

Gravity roller conveyors—Using only gravity as motive power, these conveyors consist of a series of free-turning rollers mounted in a rigid frame. The rolls are made in various sizes to accommodate various loads, and are light enough so that even empty cardboard boxes overcome inertia of their roll tube and roller bearings. Where weight is important, as in *portable* lengths, the tube roll may be replaced by two or three short rolls, similar to roller skate wheels, mounted on a small-diameter shaft. Weight is thereby reduced to as little as 7 lb. per ft., so that one man can easily handle a 10-ft. section. Both the regular and lightweight types are available in various widths with adjustable stands. They may be had in 30-, 45-, 60- and 90-deg. curves.

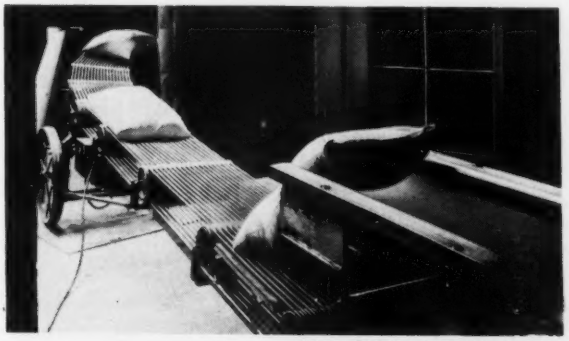


PHOTO, COURTESY GENERAL ELECTRIC CO.

2—Boxes do not pile up on this line where a photoelectric beam stops vertical lift when intercepted.



3—Roller conveyor by Food Machinery Corp. may be set in straight lines or curves and may be adjusted for gravity. Available in five standard widths.



PHOTO, COURTESY E. C. HORNE MACHINERY CO.

4—This Flexoveyor with steel spring belts can convey around turns and from one elevation to another.



5—These Jeffrey beltconveyors are adaptable for bulk packages of many different sizes and weights. Here they transport heavy textile bags the length of the production room.

Gravity chutes—Made of structural steel and sheet metal, these chutes confine the load and reduce the speed of short travel from an upper to a lower level. Spiral chutes are used for longer drops and in places where space is limited, such as between floors.

Live roll conveyors—Similar to the gravity roller conveyor, this type employs mechanical devices to power the rolls. Power belts are snubbed against the under side of the rolls under tension supplied by snubbing rolls and sheaves located between the carrying rolls. Flat belts are used for straight travel, and round belts for curving travel. Chain types driving through sprockets on the rolls are also employed. Roller spirals, as mentioned above, can be powered with round-type belts, thus enabling loads of varying weights to flow down declines continuously without danger of crushing fragile loads between heavy loads. Loads also can be elevated in this manner without necessity of transfer from a horizontal to a vertical conveyor.

Belt conveyors—The belt conveyor is perhaps the best known type of power conveyor. Frequently, rollers are used for the intermediate sections between the end pulleys, but a more modern, and usually a more economical, intermediate is the "slider" type. Ordinarily the bottom and side guards are formed of one piece of metal, and the belting slides in this trough. The slider type of intermediate is confined to comparatively light loads weighing not more than 50 lb. per sq. ft., because of the increased friction which results in greater wear when heavy loads are conveyed.

One modification is the cooling conveyor, the so-called "to-fro" table which finds application wherever ointment, toilet cream, shortening, etc., are filled hot or even warm. This type consists of a table made up of 2–10 belts, each $3\frac{1}{2}$ in. or more wide. The alternate parallel belts move in opposite directions, and turntables between them at the ends provide for the transfer of containers from belt to belt. Obviously, if the containers are to be discharged at the end opposite to the place where they are filled, an odd number of belts must be provided. If they are to be discharged at the same end, an even number is required. If 40 min. are required for cooling, then 200 lin. ft. of cooling belt traveling 5 ft. per min. will be needed, while only 80 ft. are needed if 2 ft. per min. is the speed. Linear speed does not determine production capacity since that is a function of the container filler. However, the belt must travel fast enough to allow clearance between containers to facilitate heat dissipation.

Booster conveyors—Belts are often installed to convey loads up or down inclines. Cleats may be fastened in the belting, the maximum angle of incline being governed by the stability of the loads. Cleats present a real problem, however, in transferring loads from conveyor to conveyor. To overcome this objection, belting with special nonskid surfaces is used. Angles of incline are then limited by the effect of the belting on the load, as well as any toppling tendency.

Chain-slat conveyors—This type of conveyor consists of two strands of chain having slats fastened to attachments on the links of chain. It is used in place of belt conveyors when either the weight or the character of the load would damage the belting. A modification is one in which the links of the chain constitute the surface on which containers travel. It is therefore limited to narrow widths. A special link construction is available which will permit curves as well as straightaway movement. Transfer conveyors are often of this type, and are utilized to transfer containers from one machine to another—for example, from a tube-filling machine to an assembly belt or cartoner, or from a jar-filling machine to a capper. It is usually just wide enough for the container to be handled, and long enough to effect the transfer. It is frequently driven by auxiliary drive from the machine whose discharge it is handling.

Overhead chain conveyors—In this type of conveyor, the chain is supported from trolleys which operate in, or on, an overhead steel track. Means for attaching the load to the chain are provided. They may be in the form of hooks or carriers.

The overhead conveyor may be constructed so that it dips when necessary to bring the load down to a working height so that it may be removed for an operation, or so that an operation may be performed while the load is on the conveyor. Likewise, the conveyor can rise when required to clear a high piece of equipment or other obstructions such as pipes. By this arrangement, it is possible to keep the floor between operations conveniently clear of objects which may obstruct the production flow.

Vertical conveyors—There are several types of vertical conveyor. The reciprocating type consists of a car suspended by chain or cable over a sprocket or sheave with a counterweight suspended at the other end. The load is usually automatically conveyed to and from the car, while the travel of the car in the shaft is controlled by limit switches. Continuous vertical chain conveyors consist of one or two strands of chain from which cars are suspended. The cars are of the finger type which comb through corresponding finger-type loading and unloading stations to effect automatic loading and unloading. This type of conveyor permits continuous loading at one level and unloading at another level at much higher speeds than are possible with the reciprocating type of vertical conveyor. Vertical chain conveyors can also be made to give fully intercommunicating service to several floors. With this type of conveyor, loads on any floor may be dispatched to any other floor.

General handling considerations

No mention has been made of the details of construction. For example, for simple gravity type conveyors alone, fully a dozen types of roller are employed for light duty and five more for heavy duty, while for mounting them some ten frames utilizing band, angle and channel iron sections are standard. Add curves, switches, Y-sections, intermediate stops and deflectors, and it becomes evident that conveyor manufacturers should engineer all but the simplest jobs.

Although it may be possible that they are at variance with those of some production men or conveyor builders, certain observations which follow should be taken into consideration before conclusions are reached regarding any specific installation.

Two conveyors, whether of the live roll or belt type, conserve much space when mounted one above the other for travel in opposite directions; but the lower one may, of necessity, be too low and inaccessible and the upper one too high for convenient loading and removal of containers or cases.

Pusher bar boosters, require constant attention to avoid jamming and damage. Therefore, inclined pebbled belts are favored for elevating cases, whether they be empty or full. Likewise, gravity chutes, whether they be made of sheet metal or are of roller construction, have often been replaced by power-driven pebbled belts. This is frequently done at the discharge end of production lines, since the adhesive is not fully set on labels, unit containers and shipping cases.

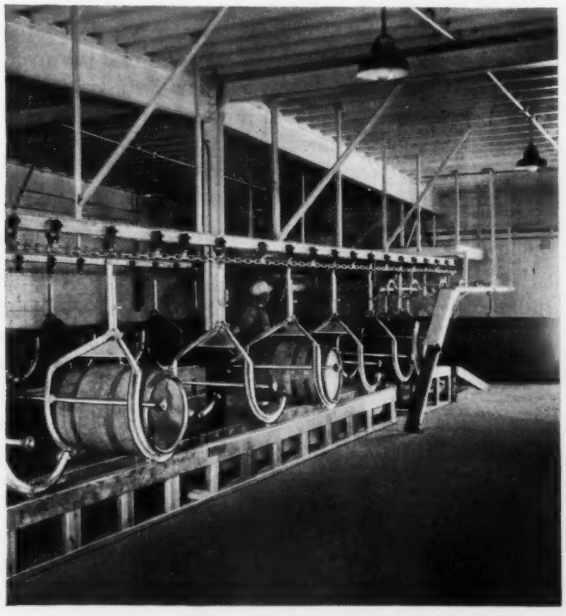
Live roll conveyors have often been preferred to belt conveyors for level stretches, especially when the lineal speed is high, or is above the manufacturer's

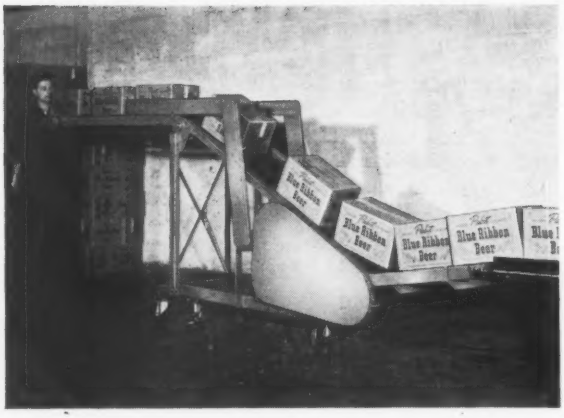
6—Elwell-Parker fork type of power truck, used to move packaged goods and tier them in unit loads.



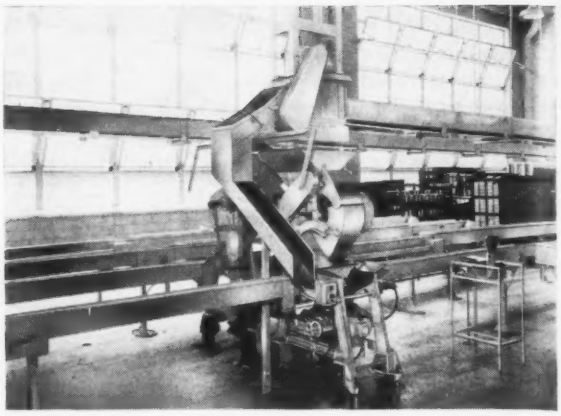
7—Overhead chain conveyors with hanging cranes move containers otherwise difficult to transport.

PHOTO, COURTESY JEFFREY MFG. CO.





8—The Standard Handipiler is designed for loading, unloading and elevating containers of all types.



9—Designed by Lamson, these lines of narrow belts deliver small cartons to four automatic fillers.

recommended maximum. Their use in such cases results in more gentle handling, and jams and attendant damage are practically eliminated. The first cost, maintenance and power consumption are admittedly a bit higher, but are rewarded.

For outdoor work subjected to the elements, as at receiving and shipping docks, only the so-called "dairy" rollers have been generally employed.

Indoors, no installation has been considered complete without dust pans if most of the materials and products handled are in corrugated or solid fibre cartons. This has been doubly true of case handling installations in the assembly or packaging department. Carton dust is an abomination over or near open containers, and female employees do not particularly relish having it in their hair.

It is usually recommended that assembly units be 30 in. above floor level. However, 34 in. proves to be more convenient when all factors are considered.

In the assembly department, several shortcomings are usually observed. The belts on the assembly tables proper often operate at too high a speed, and the operators on either side are obliged to "chase" the work needlessly. Either the minimum practical speed should be determined and the linear belt travel established accordingly or, particularly where more than one size or product is handled on the same production line, a variable speed drive should be provided.

When a variable speed drive is installed and the belt is always run at minimum speed for any work at hand, the slider bed, whether it be made of wood or metal, may offer too much "drag" due to increased number of containers per linear foot. In this case, it should be replaced by tread rollers set on centers of 4, 6, 8 or even 12 in. if the packages are light or production relatively low. Undulating motion, resulting from sagging of the belt between rollers, tends to topple containers with small bases.

Belts up to 24 in. in width are not uncommon. Study may reveal that, unless the package is quite large, widths of 12 or even 10 in. are adequate. Belts 10 in. wide are being utilized on production lines handling containers up to 8 oz. at speeds up to 120 per minute.

Sometimes the paralleling work boards are as wide as 16 in. when 12 is usually a sufficient width and when, for certain work, belts of 9 or even 8 in. are adequate. Many operations requiring standing may be changed to sitting operations by reducing belt or table width, or both. The fatigue element is thereby materially reduced. This in turn suggests that the position of the packers at the end of the line be studied. If they are facing the belt, it is usually wrong, for they must lean forward, then straighten up. If they face the discharge end of the belt, the only trunk motion required for removing and packing the finished product is a mere turning at the hips. Packers will agree that this position is more restful.

Trucks

In smaller packaging operations, lift trucks may often be utilized to bring empty containers to the head of the production line and to remove the finished cases from the discharge end to the shipping or finished goods area. Even where there is a complete installation of conveyors, lift trucks can be economically employed to bring such items as closures, folding cartons in the flat or set-up boxes, to the proper point on the assembly line for use. Likewise, trucks may be used in the receiving department and in the shipping department, especially when several sizes or products are to be assembled.

In volume operations and where the finished product is either bulky or heavy, forked trucks and pallets continue to be most widely used. Forked trucks with electric motors seem most suitable in many cases. However, for certain applications under certain conditions, trucks having gasoline motors are preferred. The articulated fork truck permits mechanization of handling where hand trucks were formerly deemed necessary because of space limitations. The articulated fork truck turns in a smaller radius, works in narrow aisles, and spots loads quickly and easily.

Inspection on the production line

In the following discussion, the primary concern is with the inspection of the finished package, not with the inspection of its contents or of the packaging components before they reach the packaging line. It is assumed that the raw materials used in the product itself have been thoroughly inspected and/or chemically analyzed before manufacture and that the product is of high quality. It is also assumed that the package components have been rigidly inspected and that those which are below standard have been rejected before delivery to the assembly floor.

The production man who is critical of the findings furnished to him will discover that the various suppliers will tighten up on their own inspection. If, on occasion, some supplies do slip through which are below the standards established by mutual agreement, the suppliers cooperate and correct any shortcoming. Conversely, if a stock item is used and the vendor has any substandard production, he will find an outlet where he knows that rigid inspection is not maintained.

Every consumer-customer of a packaged specialty is dearly won and is costly to hold regardless of the type of merchandising employed. Substandard quality of trade-marked products is simply unthinkable since it would do irreparable damage, damage which cannot be measured in dollars, to the brand name of any good household, drug, kitchen or cosmetic product which may be sold.

Nevertheless, one who is particularly interested in packaging will find a critical examination of packaged merchandise on the dealers' shelves an interesting, absorbing and perhaps profitable pastime. Labels which are blistered and applied crookedly, or with a corner loose; paste or glue smudges; torn carton flaps; cans or canisters which dust their contents; collapsible tubes which have openings out of register with the flattened end, or are improperly closed and smudged with the contents—all these create unfavorable reactions. So will a color or dirt spot on a jar of toilet cream or marshmallow whip; a particle of glass, a nicely preserved spider, a nail or a bit of carton fibre or other extraneous matter in any liquid; a piece of carton fibre or closure foil or cork in the head of the collapsible tube; a slack fill in any container. Any of these packaging faults must raise questions in the user's mind about the advertising build-up of the product he is purchasing.

In general, the constantly increasing production line speeds have no adverse effect on quality—in fact, it is not uncommon for the percentage of rejects to be reduced. The operators, whether tending a piece of equipment or performing a hand operation on a slow-moving, low-speed line, often work in a leisurely manner with minds free to wander. At higher line speeds, the operator must establish a definite time- and energy-conserving routine and must remain mentally alert if he or she is to keep pace. The upshot is usually a higher percentage of work which will pass inspection.

Organization of inspection

Cleanliness and orderliness are imperative to quality as well as quantity in line production. Better quality or larger quantity of production cannot be achieved, and waste cannot be cut by operating in untidy, unclean premises. Such conditions are always unsatisfactory and the adverse effect on employee morale cannot be measured.

Inspection is primarily a personnel problem. A quality-conscious organization is imperative whether the product outlet is a dime store, a food chain, an exclusive beauty salon or a fancy delicatessen. The organization of inspection personnel differs from plant to plant, but the type of person who makes a good inspector is cast in a fairly well-defined mold. He must be thorough and painstaking, have a good grasp of the technical aspects of the work at hand, enjoy the respect of the line operators, be neat in his dress and orderly in his actions. He must be tactful and understanding, get along well with the maintenance group and supervisory staff and be firm, but fair.

Only with time-consuming training, tolerance and encouragement on the part of management, and only with management's active support, can the inspection group be built up to full effectiveness. Then the proper place of the inspector or the inspection department on the organization chart is a moot question.

1—Inspection personnel must be carefully selected and well trained. Here the operator employs a mirror in the examination of a finished package.

PHOTO, COURTESY NORWICH PHARMACAL CO.





PHOTO, COURTESY GENERAL ELECTRIC X-RAY CORP.

2—New x-ray equipment adds to the efficiency of the inspection line. At the plant of E. J. Brach & Sons, cartoned candy passes on a conveyor through a booth containing an x-ray screen. Cartons showing suspicious foreign objects are ejected from line.

More difficulty, ill feeling and conflict have been encountered when the inspectors have operated as a department responsible only to the top management than when they have been under the supervision of the department head or superintendent. At best, it is tough to shut down a line to correct defects and make adjustments, particularly where the backlog of unfilled orders is large or when the plant is at a peak in seasonal business.

The fatigue element of certain continuous inspection jobs should receive proper consideration. If it is a sitting operation, an adjustable chair fitted to the individual may help, while a thick rubber mat placed under the feet may be used to relieve fatigue in a standing operation. Where eyes are under strain, as in inspecting a line of bottles passing behind a magnifier, or in cases where the eyes and arms grow weary inverting and inspecting containers at an inspection booth, rotating inspectors at hourly or other stated intervals may improve inspection.

Inspection tools

The tools of inspection vary widely, but a few observations may be made. A straight-side graduated cylinder for volume checks is not so fast nor so accurate as a volumetric flask with "over" and "under" as well as "correct" graduations. Check-weighing scales should be chosen for each specific job in the interest of speed, accuracy and easy reading. The special beam of light for clarity of solutions and the electric eye for various applications may well be explored. Recently, x-ray has been used to examine products and their arrangement in the container after they have been packaged.

Inspection reports

Spot inspection of each day's production the following morning not only catches many shortcomings of contents, findings and assembly, but has a highly desirable salutory effect. This "morning after" inspection may well be made in the presence of the one in charge of the department, and by a different foreman each morning. It can be made quickly and thoroughly by the use of carefully prepared forms—one for each product packaged. Provision must be made for reconditioning the opened shipping and individual containers and for returning to finished stock storage.

A typical form for reporting inspection findings is outlined below. This one was drawn up for a liquid product packed in glass, but the general pattern may be adapted to other products.

BOTTLE
- Design
- Flaws
- Glass distribution

CLOSURE
- Defects (material or decoration)
- Tightness
- Secondary closure

CONTENTS
- Clarity
- Fill height
- Foreign matter
- Color match

LABELS, MEDALLIONS, NECK BANDS
- Correct for product identity
- Registration
- Colors
- Straight
- Properly spotted
- Scuffed
- Glue smudge
- Adherence

INDIVIDUAL CARTON
- Correct for product identity
- Registration
- Color
- Properly closed
- Scoring
- Gluing

SHIPPING CASE
- Correct for product identity and count

EXTERIOR
- Clean
- Scuffed
- Torn flaps
- Top or bottom gluing
- Taping or strapping

INTERIOR
- Dust
- Partitions
- Fit

Consumers have been quite tolerant and patient, not so much by choice as through necessity—but they are reverting to type and becoming more critical than ever. There has been a dangerous tendency, under stress of demand and unavailability of materials and labor, to relax inspection vigilance. The lack of uniformity in findings may be condoned, but not a lack of uniformity in contents.

Where lax inspection or its elimination has resulted due to labor shortage or sensitiveness of labor, it should be tightened up or restored. Whether sampling or continuous inspection is necessary is dependent upon the type of product and possibly its price bracket. The inspection procedure should be all-embracing.

Maintenance problems

Once, a bottler of soft drinks found that he could not operate his fine new plant efficiently because he had failed to build up a suitable maintenance group. In the old plant, he had depended on a small neighboring machine shop and so, in desperation, he bought out the shop, made the owner his maintenance foreman, and, incidentally, used the equipment in his maintenance department. Manufacturers who have failed to plan for proper maintenance may well profit by this example—the maintenance department is an essential one in every sizable plant.

For certain products, production line speeds have increased to figures thought to be impossible a few years ago. It follows that the "down" time becomes more and more important, and that prompt and proper maintenance becomes more and more of a problem if the line is to run smoothly.

As production line speeds are increased, the equipment becomes more complex and more intricate, and the need for a higher degree of skill and a wider, longer experience for those charged with its maintenance becomes even more important. For example, a single-station labeler run at speeds of 60–68 containers per min. may have 8–10 cams mounted on the drive shaft, whereas there will be 14 or 15 cams on the two-station, or duplex type running at 110–125 containers per minute. Ordinarily, if the latter breaks down, more skill and time will be required to rehabilitate it. The lost production not only will be greater when measured in minutes, but it will nearly be double when measured in container units. The days have passed when the care of the equipment could be left to the operators, and a machine operator who shows unusual aptitude can no longer be made a line mechanic or a maintenance foreman. In fact, the practice of forbidding the operator to touch his machine or even to carry a wrench is becoming general, and call bells or enunciators have been installed to call the mechanic to the exact trouble spot promptly.

Line changes

Some equipment manufacturers facilitate size and product changes by providing complete subassembly units which have a positive location and require no adjustments.

It is true that such equipment is more expensive, of course, but the price is fully warranted. Until this practice becomes widespread, production and maintenance men must worry along using every possible device for making effective and expeditious line changes.

Good production planning can make the inevitable size, brand or product changes fall out of working hours or during the luncheon period. Preventive maintenance, too, can do much to minimize the "down time," and is a splendid objective.

However, breakdowns do happen and, like flat tires, they always come at the wrong time. On such occasions, makeshift corrective maintenance is justifiable if only to hold the equipment together to finish out the day or the scheduled run. In such cases, one expedient is sometimes overlooked among the temporary measures. This is reducing the line speed. If the regular speed is 100 per min., it takes courage to cut it to 80, 70 or even 60 so as to finish the run or the day. In last analysis, however, the criterion is not how many containers can be filled a minute, but how many presentable and salable units can be produced per hour. To produce some packages at increased cost is better than to produce absolutely none at the regular standard manufacturing cost.

Even though line changes are made outside of the regular production hours, all the niceties of adjustment which made for efficiency on the previously run package are lost.

After the line has been completely changed, it requires innumerable minor adjustments, among them: fill height on the filler; tension on the capper head or corker; glue film on the labeler, cartoner and/or bundler; guide rail spacing; and chain conveyor speeds. Here, then, is another place where the best mechanics are invaluable. The mechanic brings his skill, his science to the packaging plant but he must acquire knowledge of the art, the technique, the kinks and the tricks of the given line setup. The practiced eye, the feel and the touch and even the ear play a part, and this "know how" is slowly gained only by living with a production line.

Final adjustments must all be made when the line is in full operation with the complement of operating personnel. Attendant loss of production, as well as some breakage and spoilage must be expected at this time if a line change is to be made.

It is wise to establish a standard practice for dumping and salvaging the contents, soaking damaged labels off, reclaiming closures, etc., and making proper disposition to reduce confusion. All the above constitute a real expense, and proper corrective steps are often not taken.

There is usually one best procedure to effect necessary line changes whether liquids, creams or solids are being packaged, and whether semi- or full-automatic equipment is used. A chart of the best order for disassembling and reassembling line may be prepared from accumulated experience, and the chart should carry instructions for making the change and necessary adjustments.

XUM

Replaceable parts

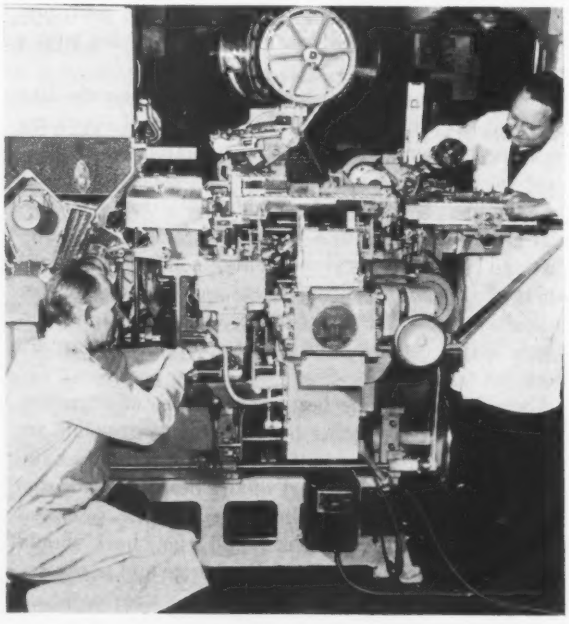
Replaceable parts for each piece of equipment should be held in the parts-storage or maintenance shop, and not be left in the packaging area. They should be brought to the job as complete units in a suitable receptacle, and an empty container should be furnished for the parts to be removed. With this procedure, several machines can be worked on simultaneously, each by a different mechanic, if change-over time is an important factor. The receptacle may be a wooden or metal box of proper size and convenient shape in which the various change parts are suitably arranged in trays and on hooks attached to the sides. If it is too heavy to carry, a buggy with casters of large diameter may be provided. If the buggy is of the proper working height, it will at once eliminate or minimize stooping and obviate the necessity for using the floor as a work table.

It is also well to provide in the box any tools which may be necessary to make the change, particularly if special gadgets or wrenches are required. These will save needless steps and may even prevent accidents. Parts or tools left lying on the equipment may vibrate into moving parts after the equipment is in operation. They will not only endanger the equipment, but will also delay production.

Accurate records of breakage and failure of parts can be of inestimable value in determining which parts should be carried in stock. Manufacturers, too, can be helpful in deciding what parts it is wise to carry as spares. Among other determining factors are relative geographical location with respect to equipment manufacturers; the ability of the maintenance department to make parts; the location of the plant with respect to jobbers' stocks of pinions, gears and bearings; and the willingness of nearby business friends, using the same equipment, to make an emergency loan.

Efficiency of such modern machines as this cigarette packer must be maintained by capable crews.

PHOTO, COURTESY AMERICAN MACHINE & FOUNDRY CO.



Lubrication

The large plant should have a designated individual who is charged with proper lubrication at regular intervals. If properly trained, he can be a good inspector, a watchdog, ever on the alert to anticipate and report weakness and possible failure. Every hard-to-get-at grease fitting should have an extension fitting which makes it readily accessible. A portable grease gun on casters, actuated by compressed air or other power, is not only an aid to thoroughness but a sound investment in labor saved in all larger plants.

Lubrication is only too often left to chance in the small plant. The lubrication provisions, even on complex equipment, have been so simplified that, if there is no better way, operators can be charged with their lubrication at regular fixed intervals.

Bakeries and other food plants, as well as many packagers of tobacco products and pharmaceuticals, use lubricants which are not deleterious to health should they come into contact with the packaged material. Not only are these lubricants of U. S. P. quality, but they are generally lighter in color and look more inviting than other lubricants.

Organizing the maintenance department

The manner in which maintenance is organized can be a builder or demoralizer of employee morale. Nothing is quite so disturbing to supervisors and workers alike as poor maintenance, particularly if they work under some incentive arrangement. If a line change is not completed on time or as promised, if the wrong parts are in place or the right ones are not properly aligned, the facts are immediately obvious to all workers. When a line breaks down, the degree of cooperation extended and the zip displayed by the mechanics in getting it back in running order, can also bolster or tear down all-important morale.

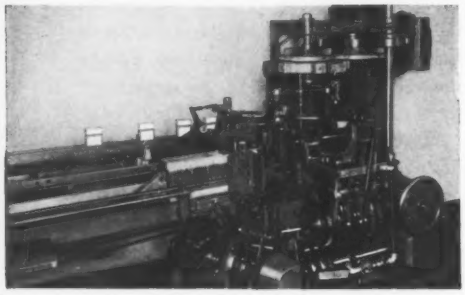
A roving group of mechanics is still used in many plants. They are ready to give corrective attention to equipment, as, when, where and if it is required on any line. Other plants have designated one or more mechanics to service each packaging line. They may have no other assigned duties, or they may perform some bench work or attend to the lubricating, or both. Each scheme has its advantages and disadvantages in actual operation and in making for harmony between the packaging and maintenance personnel.

One cosmetic plant has included the maintenance group in its wage incentive plan. The added earnings of the members ran about 6–15 per cent of their base rate of pay for an average of about 11 per cent. Experience with this arrangement has been excellent. Pay-roll dollars so planted yield a splendid return.

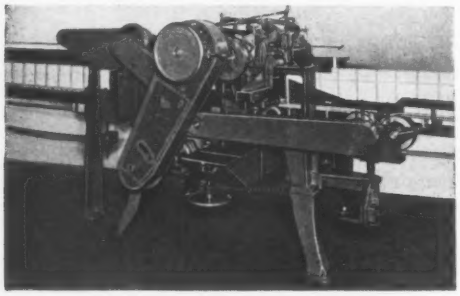
XUM

ADVERTISING FOR MACHINERY and EQUIPMENT

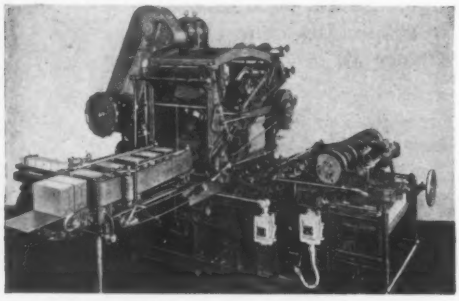
PACKAGING MACHINERY PNEU



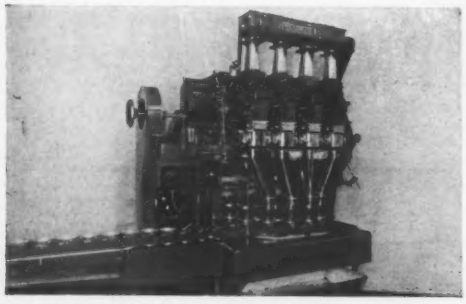
HI-SPEED CARTON FEEDER & BOTTOM SEALER—one of nine different models for feeding, forming and bottom sealing or tucking cartons at speeds ranging from 10 to 105 per minute. All models adjustable for different carton sizes within certain limits.



TOP SEALER—for glue-sealing tops of cartons. Other models available for folding liners and top tucking at speeds ranging from 25 to 100 per minute.



TIGHT WRAPPER—one of four machines for gluing printed tight wrappers to shells. Entire inside surface of wrapper is glued to insure strong sift-proof, insect proof package. Speeds from 40 to 70 per minute are entirely practical.



FOUR SCALE NET WEIGHT COFFEE WEIGHER—one of Pneumatic's 25 different types of gross and net weight weighers for handling free flowing and semi-free flowing materials. Speeds range from 10 to 100 per minute.

Pneumatic offers you the opportunity to install complete co-ordinated packaging hook-ups designed, engineered, built and serviced by one company.

OVER 80 DIFFERENT AUTOMATIC AND SEMI-AUTOMATIC PACKAGING MACHINES FOR

Carton Makers	Carton Feeders	Carton Formers
Bottom Tuckers	Bottom Sealers	Top Tuckers
Top Sealers	Wax Tight Wrappers	Weighers
Fillers	Packagers	Tight Wrappers
Labelers	Lining Closers	Lining Machines

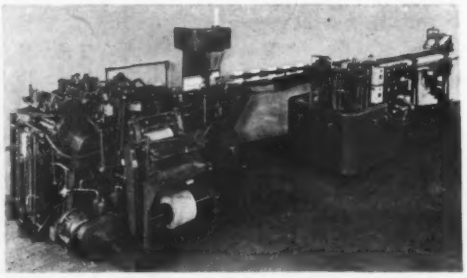
ALSO

Bag Flour Packers		Double Package Makers
Tea Baggers	Shoe Box Machinery	Can Fillers
Can Cappers	Can Labelers	Powder Fillers

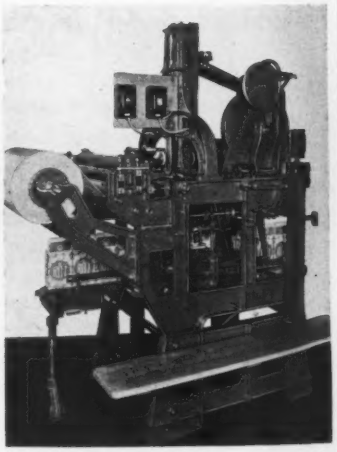
PNEUMATIC

PACKAGING & BOTTLING MACHINERY

"LOWER COST PER CONTAINER"



DOUBLE PACKAGE MAKER, AUTOMATIC FILLER & ROTARY TOP CLOSURE—a complete 3 machine hook-up for producing a package within a package. Pneumatic's new Double Package consisting of a printed carton with individual inner bag liner offers added insurance for your product against loss of flavor and freshness. An ideal container for dried fruits, pudding powders, gelatin desserts, confectioners sugar, prepared flour, individual servings of cereal, tea, coffee, etc. Send for a sample package today.



CARTON LINER—cuts glassine, waxed or plain papers from a roll, then forms, seals and inserts the bag.

PNEUMATIC SCALE CORP., LTD.

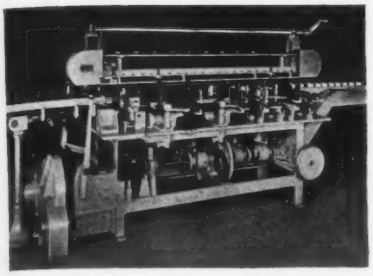
UMATIC BOTTLING MACHINERY

Pneumatic's cleaning, filling, capping and labeling machines are designed to operate as individual units or in complete co-ordinated hook-ups.

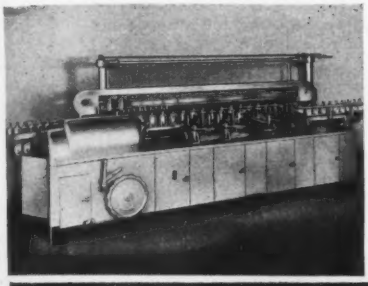
FOR BOTTLES-CANS-JARS

LABELERS

Pneumatic Labelers safeguard the appearance of your containers by assuring accurate register and dependable labeling.



SIMPLEX LABELER: One of several models for applying front only, front and back, two front and one back, or partial wrap-around labels to bottles, cans, and jars. Machine is fully automatic and can be changed from one size to another in less than 10 minutes.

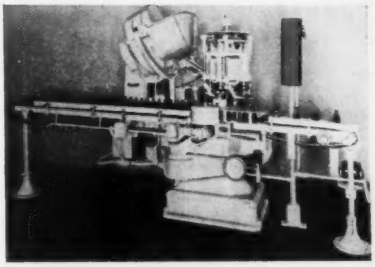


DUPLEX LABELER: Will apply front only, or front and back labels to containers ranging in size from ½ pt. to quarts at speeds up to 120 per minute.

CAPPERS

The flexibility of Pneumatic's capping machines makes handling of a wide size range entirely practical and relatively simple.

PNEU ROTARY CAPPER: A hi-speed capping machine for handling a variety of sizes and shapes of bottles, cans, and jars at speeds up to 120 per minute. Other Capping Machine Models for lower production requirements.



PNEUMATIC

PACKAGING & BOTTLING MACHINERY

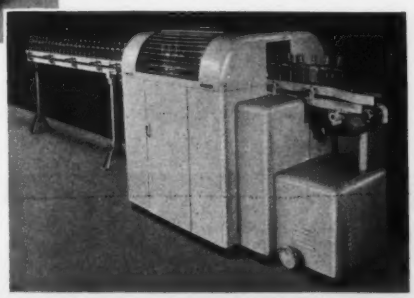
"LOWER COST PER CONTAINER"

CLEANERS



Pneumatic's Inverted Air Cleaners assure thorough cleaning of new glassware. Containers while inverted are subjected to a blast of clean, dry air which completely removes all foreign matter.

SEMI-AUTOMATIC INVERTED BOTTLE AIR CLEANER: Attendant holds two containers simultaneously and in one motion inverts them, thrusting the necks in the direction of the self-centering nozzle seal, where the air blast is received. Machine will handle a wide variety of bottle shapes and sizes at speeds ranging from 20 to 50 per minute.

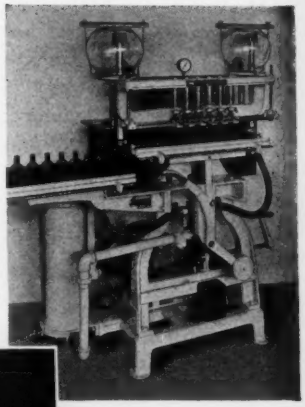


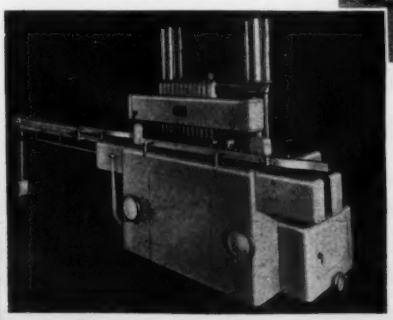
AUTOMATIC INVERTED BOTTLE AIR CLEANER: A fully automatic machine similar in operating principle to the Semi-automatic Cleaner. Will handle 3 oz. to 32 oz. bottles, jars or jugs at speeds up to 120 per minute.

FILLERS

Illustrated are two of Pneumatic's several vacuum filling machine models for accurate filling of bottles, jugs, cans, and jars at speeds ranging from 20 to 120 per minute.

SAMCO JUNIOR VACUUM FILLER: For free-flowing or semi-free flowing liquids in 1 oz. to 1 gal. cans, regular finish of AGST glassware. Parts change takes less than 15 minutes, therefore machine is particularly suited for short runs on a variety of products and containe, sizes at speeds up to 40 per minute.



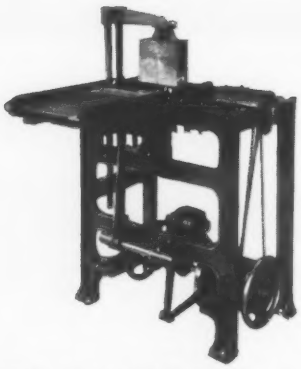


AUTOMATIC SAMCO VACUUM FILLER: Equipped with standard 12-heads this fully automatic machine is capable of speeds of 50/70 per minute on 1 oz. to 1 qt. sizes. Double bowl overflow system, high speed filling nozzles and quick size changes insure dripless filling of free flowing or semi-free flowing liquids.

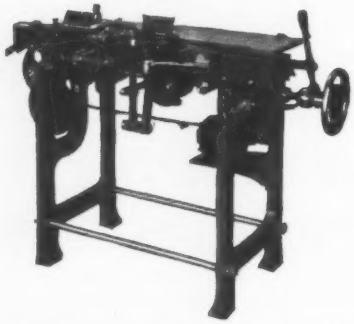
77 NEWPORT AVE., NORTH QUINCY 71, MASS.

XUM

Why Not Reduce Your Carton Packaging Costs?



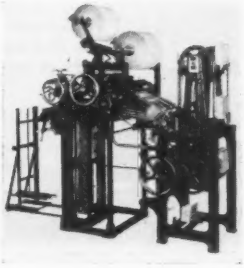
JUNIOR CARTON FORMING AND LINING MACHINE. Sets up 35–40 cartons per minute. Requires one operator. Can be made adjustable.



JUNIOR CARTON FOLDING AND CLOSING MACHINE. Closes 35–40 cartons per minute. No operator. Can be made adjustable.

During the months which have passed since V.J. day practically all plants have faced the same problems, shortages of materials, lack of man power and rising costs of doing business. All these problems are weighing heavily on the shoulders of the executives who are responsible for production.

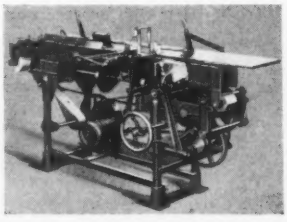
Perhaps you are one of those who are investigating any and all possible angles of cost reduction. Perhaps you are suffering from lack of personnel in your Carton Packaging Department. If your plant uses cartons, look into your present packaging methods. If you find that you are using hand methods to set up and close cartons, it may well be that the use of PETERS machines for these tasks can speed up your entire production schedule and at the same time reduce your labor requirements substantially.



SENIOR CARTON FORMING AND LINING MACHINE equipped with AUTOMATIC CARTON AND LINER FEEDING DEVICE. Sets up 55–60 cartons per minute. Fully automatic.

PETERS has been able to help many companies solve their carton packaging problems. Possibly we can help you too? Complete data on the most suitable equipment for your specific needs will be sent promptly on request. Be sure to send a sample of each size carton you are interested in handling. It will pay you to investigate these economical machines.

PETERS machines are built in several sizes and in both fully automatic and semi-automatic models to handle production requirements ranging from 30 to 60 cartons per minute. They are widely used in the packaging of such products as frozen foods, biscuits, crackers, macaroni, spaghetti, noodles, lard, shortening, cheese and similar items.

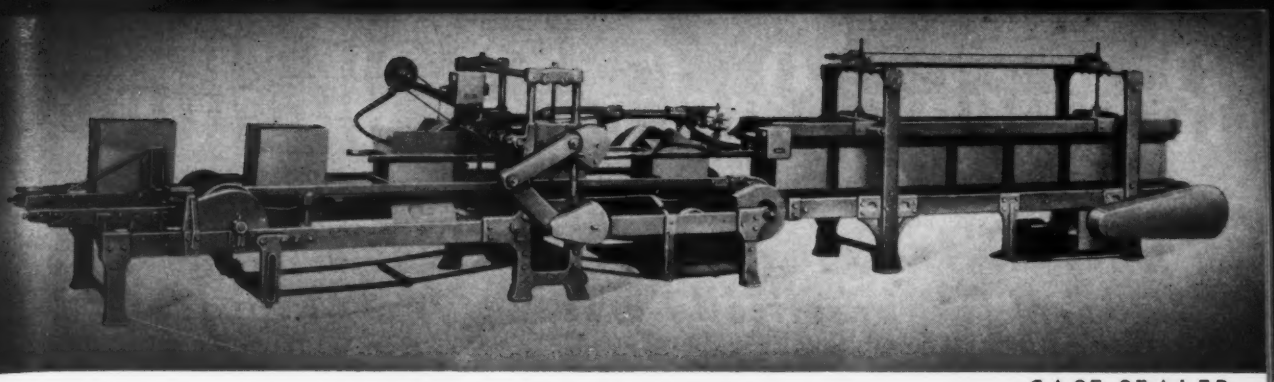


SENIOR CARTON FOLDING AND CLOSING MACHINE. Closes 55–60 cartons per minute. Fully automatic.

Also makers of PETERS CELLULOSE SHEETING AND STACKING MACHINE. Used to cut roll stock into sheets.

PETERS MACHINERY CO.
4700 RAVENSWOOD AVE., CHICAGO 40, ILL.

XUM

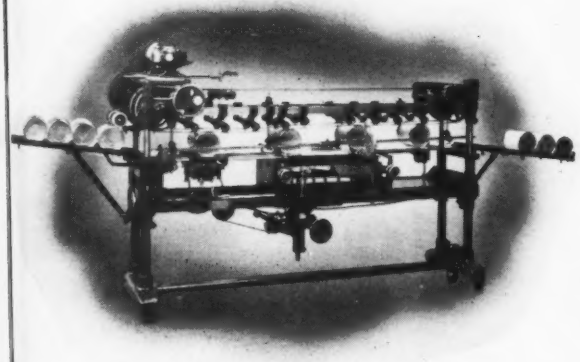


CASE SEALER

LABELING-SEALING-CASE PACKING-BAG PACKING

ALL AROUND YOUR PACKAGING LINE

LABELER



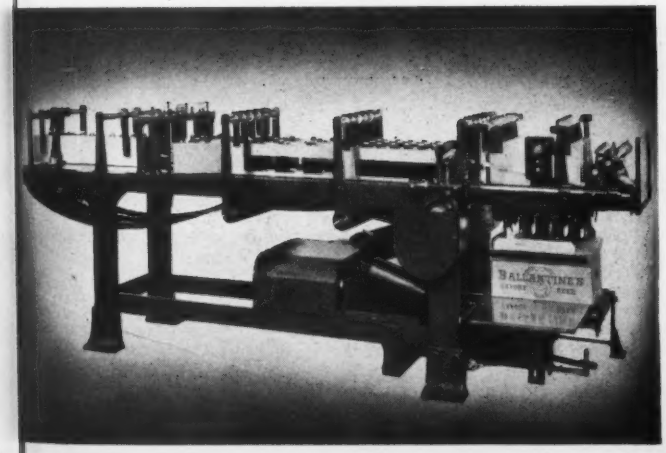
it's

STANDARD-KNAPP

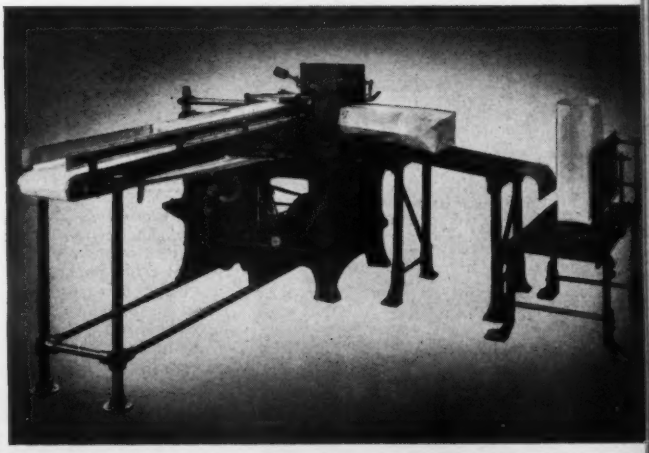
We can't show you all the machines that we make. But picturing a variety we have tried to indicate the versatility of our packaging machinery, design and building service.

STANDARD-KNAPP case sealers are used in most of the leading plants of most high production packaging industries, including beer, cigarettes, household products, canned soups, etc. Other STANDARD-KNAPP machines have also become standard for quality in various operations. In addition, we have constantly developed new types of equipment for specialized packaging purposes as for instance the bag packer developed for the sugar industry and shown on this page. Whether it is a variation of one of our proved machines, or a new design to handle some new packaging operation, we think we can give you the right answer.

BOTTLE PACKER



BAG PACKER



STANDARD-KNAPP CORPORATION

MANUFACTURERS OF CASE SEALING, CASE PACKAGING, AND CAN LABELING MACHINES

FACTORY and GENERAL OFFICES—PORTLAND, CONNECTICUT

570 Lexington Avenue
NEW YORK 22, N. Y.

221 North LaSalle St.
CHICAGO 1, ILL.

145 Public Square
CLEVELAND 14, OHIO

300 Seventh Street
SAN FRANCISCO 3, CALIF.

420 S. San Pedro Street
LOS ANGELES 13, CALIF.

3224 Western Avenue
SEATTLE 99, WASH.

1208 S.W. Yamhill Street
PORTLAND 5, OREGON

Paul Brown Building
ST. LOUIS 1, MO.

Windsor House, Victoria Street, LONDON, ENGLAND

Redington Packaging Machines

have a 49-year record of packaging jobs well done for practically every type of product



CARTONING MACHINES

Consult Redington for automatic cartoning of practically any solid item. Machines are available for inserting bottles, jars, collapsible tubes, razor blades, candy coated gum, oleomargarine, macaroni, soap and *almost any other* solid item or container in glued-end or tuck-end cartons. *Redington* Cartoning Machines can be equipped with circular mechanism for automatically handling printed advertising matter—means for code stamping carton—means for printing on cartons—mechanism for other features such as placing a corrugated protector around bottles.

WRAPPING and CELLOPHANE WRAPPING

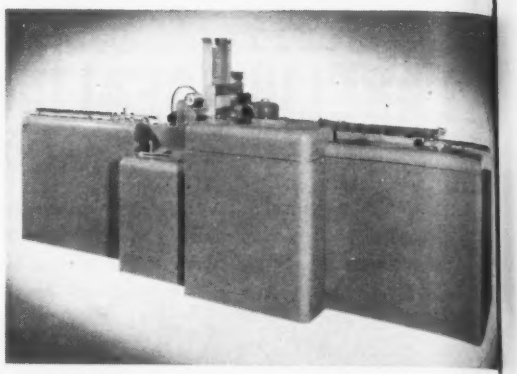
Consult Redington for high speed wrapping machines for handling products in Cellophane, Sylphrap, wax or glassine paper and *other wrapping materials.* Redington Wrapping Machines can be equipped with mechanisms for applying "Easy Opening Tape"—with photoelectric cell mechanism for controlling cut-off of printed design—with special mechanism for handling government stamps for tobacco packages, and with many other special mechanisms.

Combination CARTONING and WRAPPING

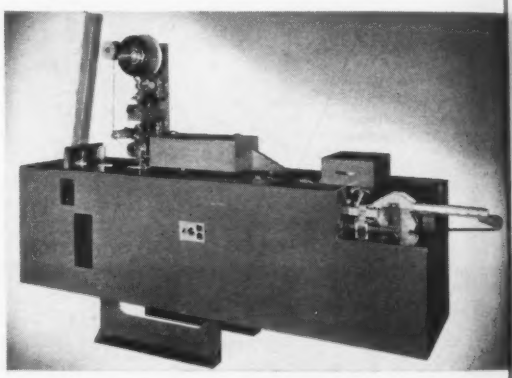
Consult Redington for machines for such items as the Schick Injector package, candy coated gum and other packages where it is advisable to carton and wrap on the *same* machine. Photoelectric cell mechanism for registering printed wrapping material, and easy opening tape mechanism are available.

SPECIAL PACKAGING

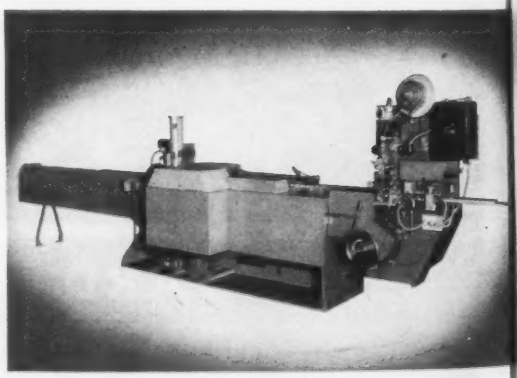
Consult Redington for packaging machines that defy classification . . . the unique wrap of Listerine, the double wrap for Crystal White Soap, the interlocking wrap for tins of Underwood's Deviled Ham, the Phillips Milk of Magnesia package, Bayer tins of Aspirin, Life Savers, professional and sample envelopes for Bayer Aspirin and Grove's Laxative Bromo Quinine.



Type 23 Continuous Loading Cartoning Machine for handling Fitch's Ideal Hair Tonic. Same type machine built for items shown at the left, as well as for many other products.



Type 96 high speed Cellophane Wrapping Machine with means for applying Easy Opening Tape. Machine shown was built for wrapping cigarette packages. Available for high speed wrapping of similar items.

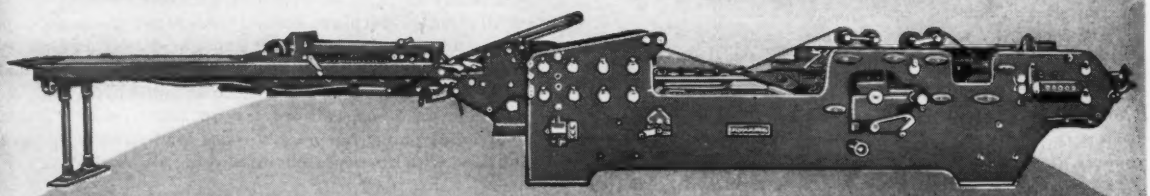


Type 23 Continuous Loading Cartoning Machine combined with Cellophane Wrapping attachment. This combination unit not only inserts article into carton but also wraps closed carton in Cellophane.

F. B. REDINGTON CO. (Established in 1897) 108 So. Sangamon St., CHICAGO 7, ILL.

XUM

INTERNATIONAL *automatic* BOX MAKING MACHINES *are established* TOP QUALITY



International box making machines have been in successful use by box makers all over the world since 1903. We make automatic equipment to perform the following box making operations:

- Folding and gluing
- Crease-breaking, folding and gluing
- Infolding
- Hot finish paraffining
- High gloss paraffining
- Applying windows to previously apertured blanks
- Applying liners to frozen foods box blanks
- Folding and stitching suit boxes
- Folding and stitching bottle carriers
- Combination — Folding and gluing, crease breaking, double side walling, spot gluing and infolding.

THE INTERNATIONAL PAPER BOX MACHINE CO.

315 MAIN STREET • NASHUA, NEW HAMPSHIRE

XUM

Put your wrapping problems up

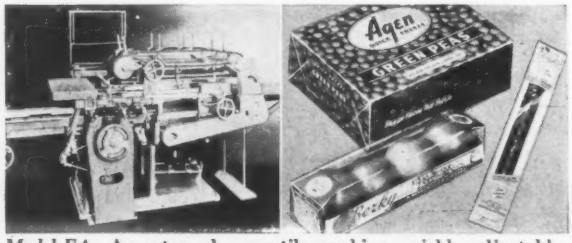
THE Package Machinery Company has not only a most complete line of wrapping machines, but more than 30 years of experience in solving special packaging problems. Its engineers and designers have, moreover, been instrumental in bringing about many of the most important packaging advancements such as: machines adjustable for various sizes . . . electric-eye registration for printed material in roll form . . . wrapping which features an easy-opening device . . . machines that bundle a group of packages, thereby making large savings in packing costs, etc.

We are also producing machines for goods that have never been packaged before. Today such products as sheets, towels, diapers, hosiery, underwear, fruits and vegetables, etc. are in line for greater sales at lower cost, thanks to developments undertaken by our engineering staff.

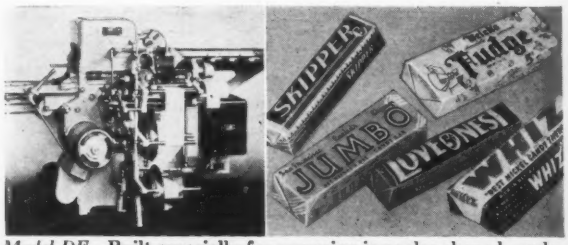
Shown below are some of the many models available. A number are universal types—others are especially designed for a particular product or style of wrapping. Most models are quickly adjustable for various sizes, and are adaptable to practically any kind of wrapping material.

All of our machines embody advanced mechanical principles, and numerous improvements have been introduced as a result of developments carried on during the war and in the postwar period. They operate at high speed, require the minimum of labor, and are easy to supervise and maintain.

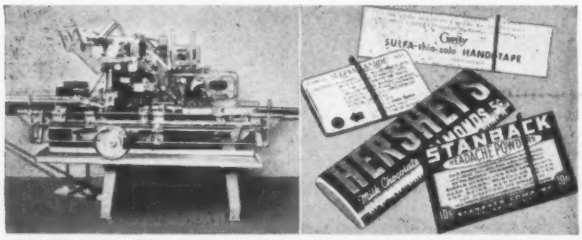
Write or phone our nearest office for literature or for consultation with our representative.



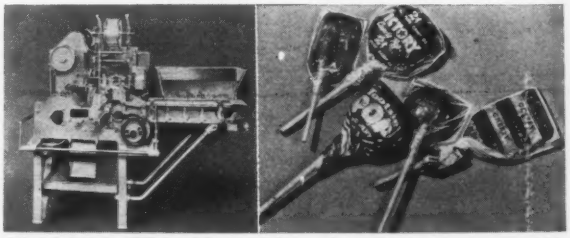
Model FA—An extremely versatile machine, quickly adjustable for a wide range of sizes. Handles open boats and flat objects as well as cartons. Uses any type of wrapping material. Speed, 100 packages per minute.



Model DF—Built especially for wrapping irregular shaped candy bars, this machine produces a uniformly sized, perfectly formed wrap, irrespective of product shape. Electric eye locates the printed design accurately on the bar. Quickly adjustable. Speed, 130 bars per minute.



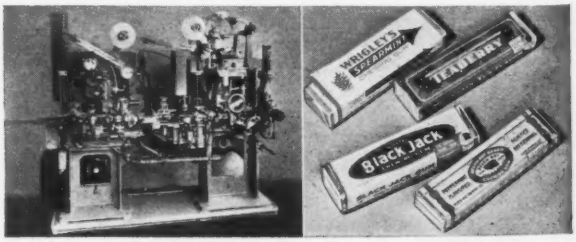
Model CA-2—The CA machines have proved adaptable to many different types of products—chocolate bars, tape bandages, headache powders, etc. Inserts an easy-opening tape in wrapper, if desired. Quickly adjustable. Speed, 80 to 150 per minute.



Model LP-3—With this machine, one operator can wrap 100 pops per minute. Saves labor and 15% to 20% in wrapping material. Uses heat-sealing cellophane or waxed paper. Last fold and twist are sealed by heat.



Model CM-2—Wraps small packages at extremely high speed—up to 250 per minute. An easy-opening tape may be incorporated in the wrapping, if desired. Easily adjusted for various sizes. A companion model, the CM-T, is used by leading cigarette manufacturers.



Model AC, AC-6—Makes the standard chewing-gum package, performing all operations. Wraps and bands each stick individually, assembles five sticks, then bands package with printed label and applies cellulose wrap with easy-opening tape. Speed, 600 sticks per minute.

PACKAGE MACHINERY

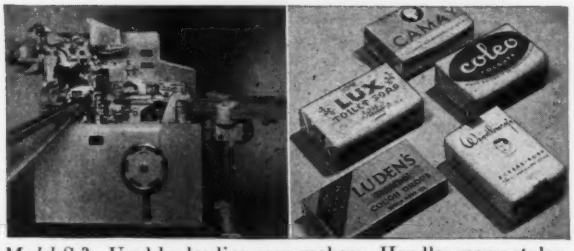
to PACKAGE

Makers of the most widely used Wrapping Machines

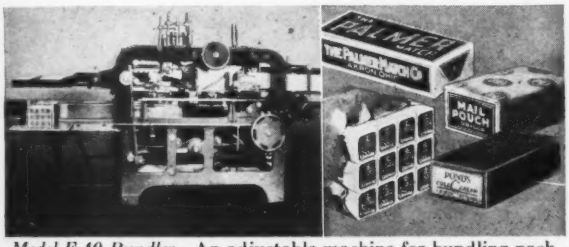




Model 22-B—Wraps candy in individual pieces. Handles hard or soft-center pieces in many sizes, odd and fancy shapes. Does combination type wrapping (for example, inner wrapper of foil, outer wrapper of transparent cellulose). Speed, 120 to 150 pieces per minute.



Model S-3—Used by leading soap makers. Handles many styles of wrapping. Adjustable for different sizes. Inserts cardboard or circular, if desired. Speeds up to 200 per minute. This machine has also been adapted to other products.



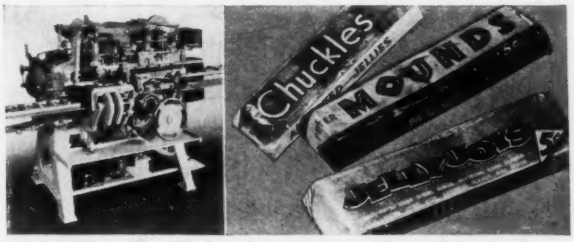
Model F-10 Bundler—An adjustable machine for bundling packages in various quantities. Registers printed panels accurately. Attaches end-seals. Machine bundling makes striking savings in both labor and material costs.



Model F-9-T—This machine, especially designed for the purpose, wraps paper towels and toilet tissue in roll form, attaching end-seals.



Model HRB—A razor blade wrapping machine with a speed of 150 blades per minute. Applies inner waxed paper wrapper and outer printed wrapper at one time. No part of machine touches cutting edges of blade.

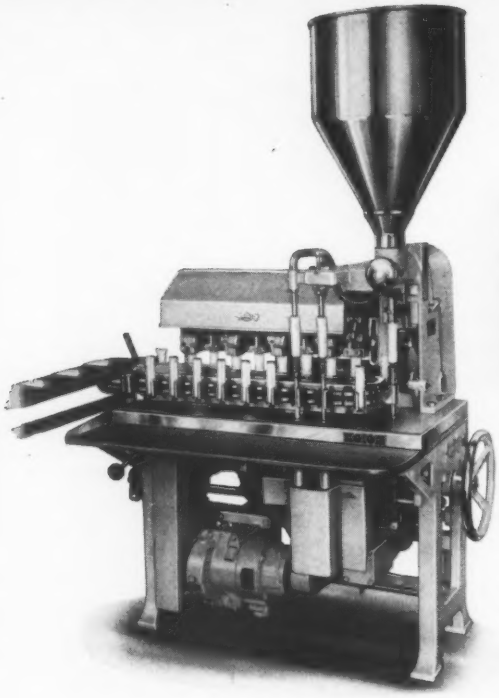


Model GH-2—The ideal machine for wrapping small candy pieces, or similar objects on a cardboard tray. Forms the tray from previously scored board. Registers wrapper accurately by electric eye. Speed, 70 to 80 per minute.

COMPANY SPRINGFIELD 7, MASSACHUSETTS

NEW YORK CHICAGO CLEVELAND ATLANTA LOS ANGELES TORONTO

PRECISION-BUILT MACHINERY . . . . . .



ARENCO
TUBE FILLING MACHINE

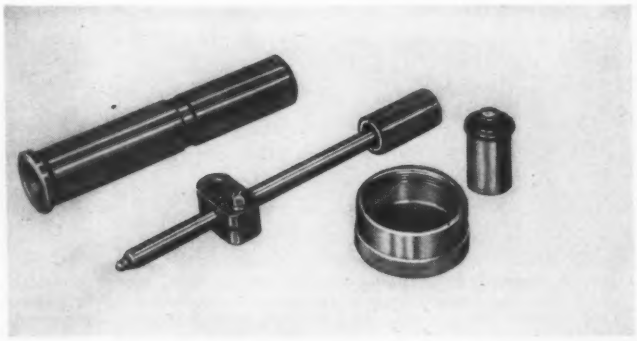
This machine fills, closes and seals collapsible tubes. It handles pastes, creams, lotions and liquids.

ARENCO MACHINES *Feature*

1. Automatic cap tightening.
2. Automatic tube cleaning before filling.
3. Positively correct quantity in each tube.
4. Clean filling—no spattering of inside closure wall—no material trapped in folds.
5. No tube, no fill—no material delivered from filling nozzle if tube is missing.
6. Ample passage for material—no valves or long tube connections. No squeezing to change consistency or viscosity of material.
7. Quick cleaning when changing from one material to another.
8. Quick changing from one tube to another.
9. All parts of machine easily accessible for control, lubrication, and cleaning.
10. Stainless steel or other non-corrosive metals are used in all parts contacting the materials.

ARENCO Saves Time

At the right are shown the only parts of the pump which have to be removed for cleaning or when changing from one material to another. Complete change from one tube size to another requires 25 minutes only.



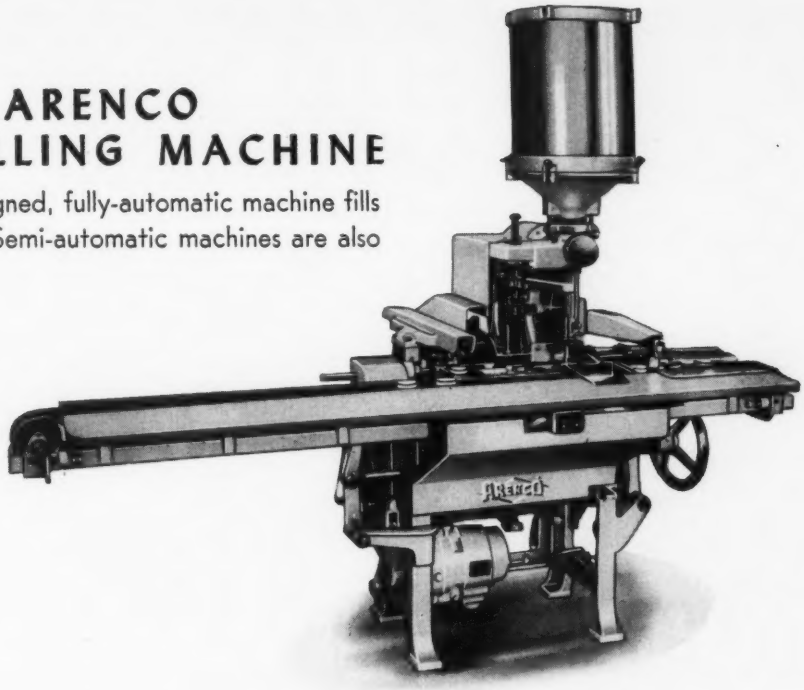
ARENCO

THE ARENCO MACHINE COMPANY
INCORPORATED
25 WEST 43rd STREET • NEW YORK 18, N. Y.

ARENCO KNOWN THE WORLD OVER

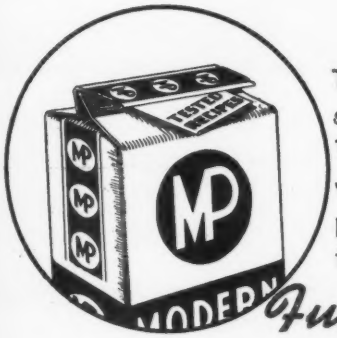
ARENCO JAR FILLING MACHINE

This newly designed, fully-automatic machine fills jars and cans. Semi-automatic machines are also available.



OTHER ARENCO MACHINES

There is a full line of other Arenco machines for the weighing, filling and closing of flour, sugar and other granular materials packed in paper bags or cartons—also Arenco machines for making satchel bottom and square bottom bags.



SEALED TRIPLE FOLD

The Arenco triple bag closure is neat, tight and practical. The sealing strip covers the fold and extends part way down the sides of the bag. There is no adhesion to the bag top. When the strip is slit, the bag opens without tearing or pulling. The closure can be folded back in its closed position easily. An advertising card or pamphlet can be placed inside the folds automatically.

Fully Equipped Service Stations in New York, N. Y. and Tampa, Fla.

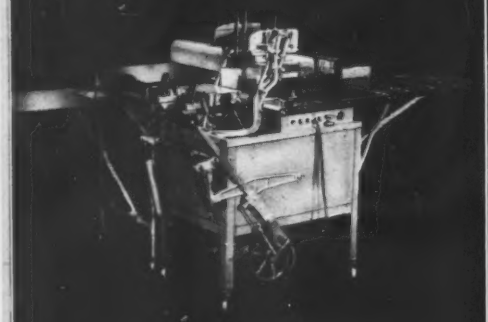
THE ARENCO MACHINE COMPANY
INCORPORATED
25 WEST 43rd STREET • NEW YORK 18, N. Y.

ARENCO

XUM

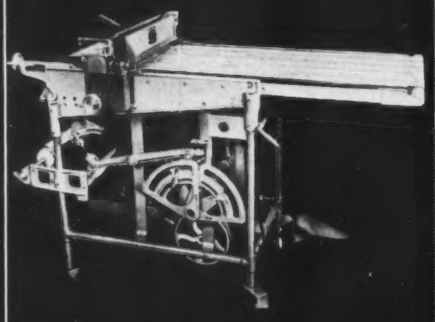
Machines for...

WRAPPING



MILLER MODEL MPS WRAPPING MACHINE

SHEETING-GLUING



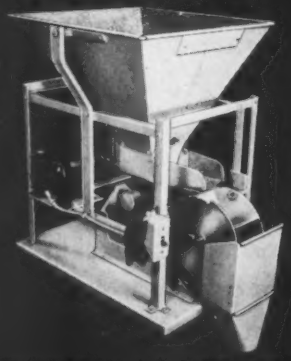
CORLEY-MILLER "SPEED-WRAP" PAPER SHEETING AND GLUING MACHINE

BAG MAKING



SIMPLEX HIGH SPEED AUTOMATIC BAG MAKING MACHINE

FILLING



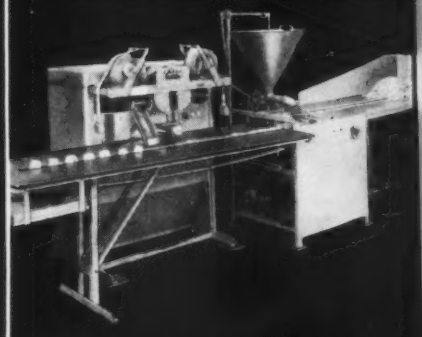
HOLM MODEL A-AH WEIGHING AND FILLING MACHINE

ROTARY SEALING



AMSCO HIGH SPEED ROTARY BAG SEALING MACHINE

SANDWICH MAKING*



THE CORLEY-KELLER SANDWICH MAKER AND CORLEY AUTOMATIC WRAPPER

Miller offers machines that bring new efficiency and economy to packaging operations . . . dependable, speedy equipment for: 1. Wrapping, 2. Sheeting and Gluing, 3. Bag Making, 4. Bag and Carton Weighing and Filling, 5. Rotary Bag Sealing or Crimping, 6. Sandwich Making and Wrapping. Also hand and foot operated heat sealing Crimpers, Hot Plates, and Hand Sealing Irons. Send for literature or ask for the assistance of our packaging engineers on specific problems.

** Makes sandwiches from crackers and peanut butter or similar spreads.*

Miller *Wrapping & Sealing Machine Co.*

18 SOUTH CLINTON ST., CHICAGO 6, ILLINOIS

SEYBOLD *Morrison*

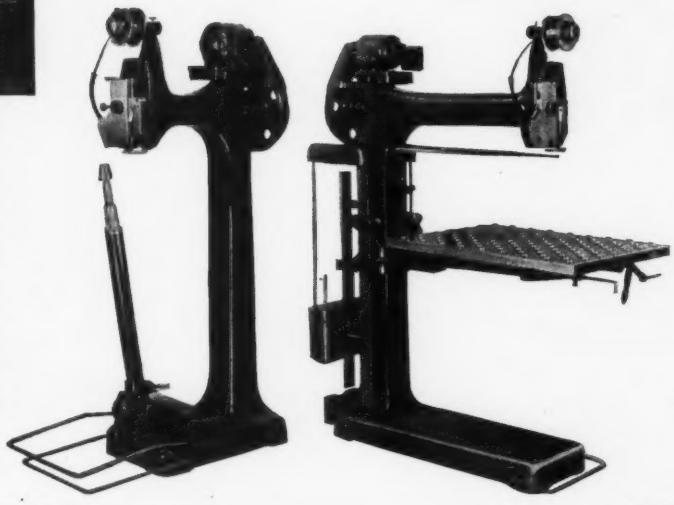
WIRE STITCHING MACHINES



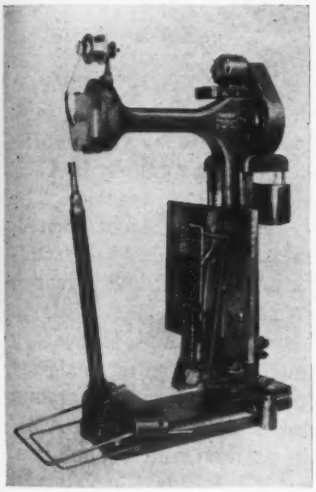
Assembling and sealing corrugated and solid fibre containers with SEYBOLD *Morrison Wire Stitching Machines* speed packaging operations and reduce packaging costs appreciably in comparison with other methods. These heavy duty machines are equipped with the exclusive and patented Type-SL Stitcher Head. Complete information will be furnished promptly.

BOTTOM STITCHING

(Above) Bottom stitching corrugated containers on the SEYBOLD *Morrison Wire Stitching Machine* illustrated at right. Designed in two models: Model SLH with 15" throat and Model SLJ with 25" throat. Where required, an arm can be installed to make the machine a combination "Arm and Bottomer."



Morrison Wire Stitching Machines are designed in two models: Model SLM with 25" throat and Model SLP with 33" throat. Equipped with blade anvil arm and quickly adjustable roller top table, as illustrated.



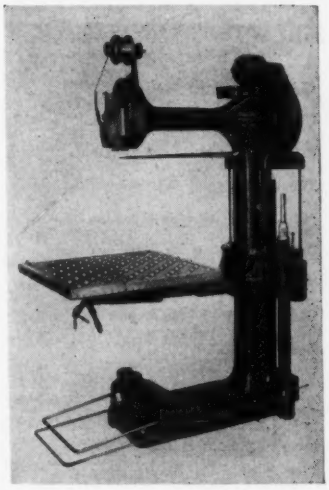
COMBINATION TOP AND BOTTOM SEALER

(At left) SEYBOLD *Morrison Combination Top and Bottom Stitching Machine* set up for bottom stitching with blade anvil folded down, counterbalanced roller top table up, and clincher post in position.

(At right) The same machine set up for top sealing. This type of unit is designed in two models: Model SLQ with 25" throat and Model SLR with 33" throat.

OTHER TYPES OF MORRISON STITCHERS

The complete line of SEYBOLD *Morrison Wire Stitching Machines* includes 15 standard models of bottom stitchers, top sealers, combination units, side seamers, and arm machines in a wide range of sizes and practical throat depths to meet practically all standard requirements.



SEYBOLD DIVISION

HARRIS-SEYBOLD-POTTER CO., GENERAL OFFICES: 4510 EAST 71st ST., CLEVELAND 5, OHIO, PHONE DI-3120

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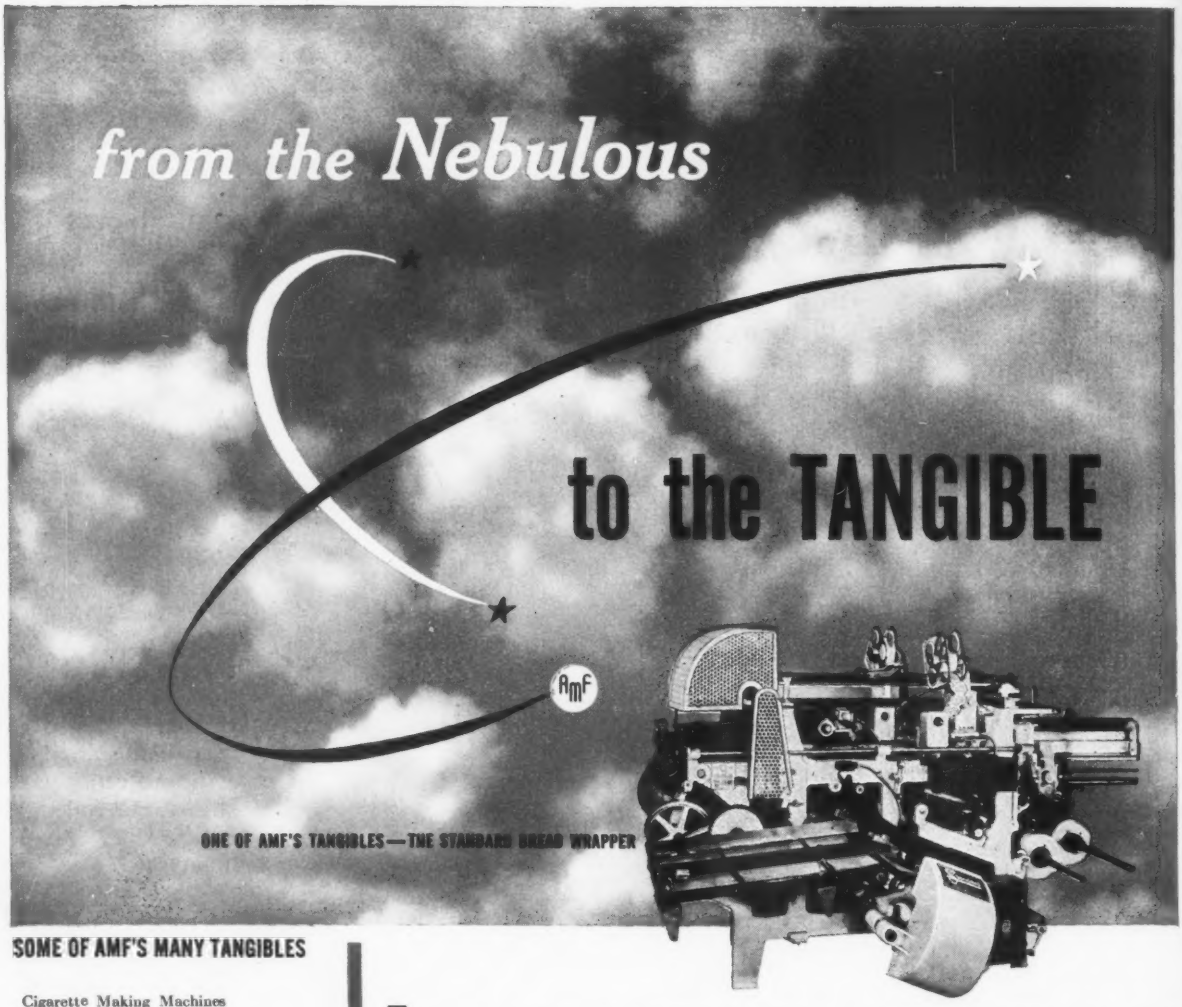
Canadian Distributor
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Harris-Seybold-Potter Co., 220 Luckie St., JA 1783

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SOME OF AMF'S MANY TANGIBLES

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- Bread Wrapping Machines
- Bakery Ovens
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- Pretzel Tying Machines
- Automatic Bowling Pinspotters
- Lowerator Dispensers

To create and build tangible machines from nebulous ideas is a task of vital importance to industrial progress. How well American Machine & Foundry Company does this job is evidenced by the number of AMF machines doing a specialized packaging job throughout America. The transition from nebulous to tangible involves a closely coordinated, highly skilled organization backed by a security founded on high standards. AMF represents master engineers working with trained research men. It represents precision construction with durable materials in AMF's own large factories. Important, too, are the thorough laboratory and field tests involved. Machines for every purpose are being designed and built for American industry by these specialists—foremost among these are in the tobacco and bakery equipment fields. Because AMF machine designers are also engineers, business men and economists, they are your guarantee that the machines AMF builds for you will do the job best.

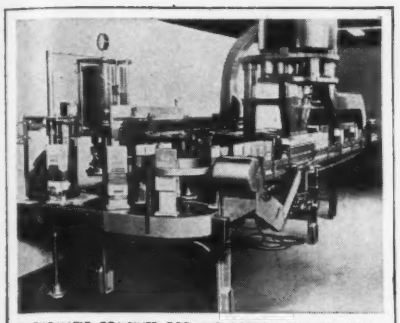
AMF INVITES CONSULTATION ON PACKAGING MACHINERY AND EQUIPMENT PROBLEMS

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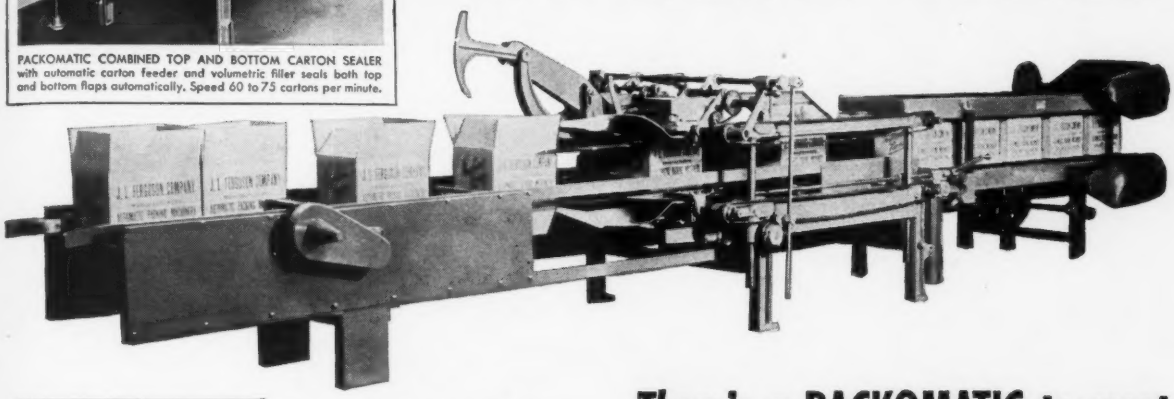
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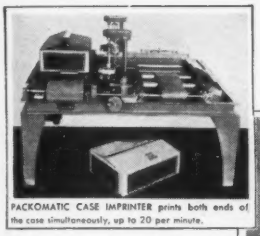
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PACKAGE FILLING *to* CONTAINER SEALING



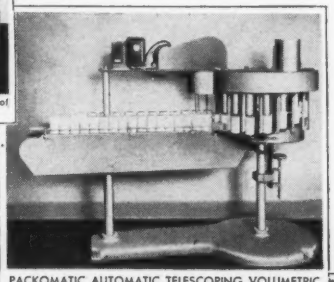
PACKOMATIC COMBINED TOP AND BOTTOM CARTON SEALER with automatic carton feeder and volumetric filler seals both top and bottom flaps automatically. Speed 60 to 75 cartons per minute.



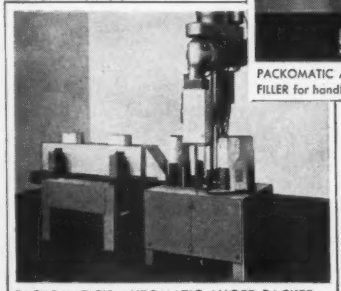


PACKOMATIC CASE IMPRINTER prints both ends of the case simultaneously, up to 20 per minute.

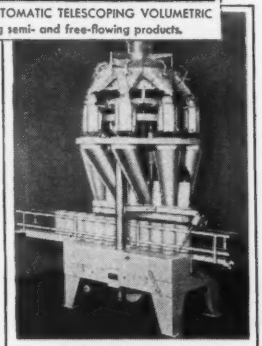
PACKOMATIC'S MODEL "D" CASE SEALER for paper shipping cartons. Seals tops and bottoms simultaneously—or tops, or bottoms only, if desired.



PACKOMATIC AUTOMATIC TELESCOPING VOLUMETRIC FILLER for handling semi- and free-flowing products.



PACKOMATIC'S AUTOMATIC AUGER PACKER—WEIGHER for semi- or non-free flowing products.



AUTOMATIC NET WEIGHT SCALE for metal & round paper cans, glass jars & rectangular containers.

There's a PACKOMATIC *to meet* YOUR *need!*

You'll find enthusiastic *performance reports* from the nation's foremost enterprises on PACKOMATIC packaging machines—from package forming and filling to shipping case sealing.

In fact, PACKOMATIC'S *new* Model "D" Shipping Case Sealer is a model of performance—50 to 3,000 cases per hour as required—squared, glued, sealed and ready for shipment or storage—quickly, efficiently, economically.

Then there's PACKOMATIC'S Combined Top and Bottom Carton Sealer with Automatic Feeder and Volumetric Filler. Seals both top and bottom flaps automatically, and operates at speeds up to 60 to 75 cartons per minute... Available in units to fill packages measured in ounces or pounds.

There's a wide range of PACKOMATIC packaging equipment...a wide scope of PACKOMATIC know-how.

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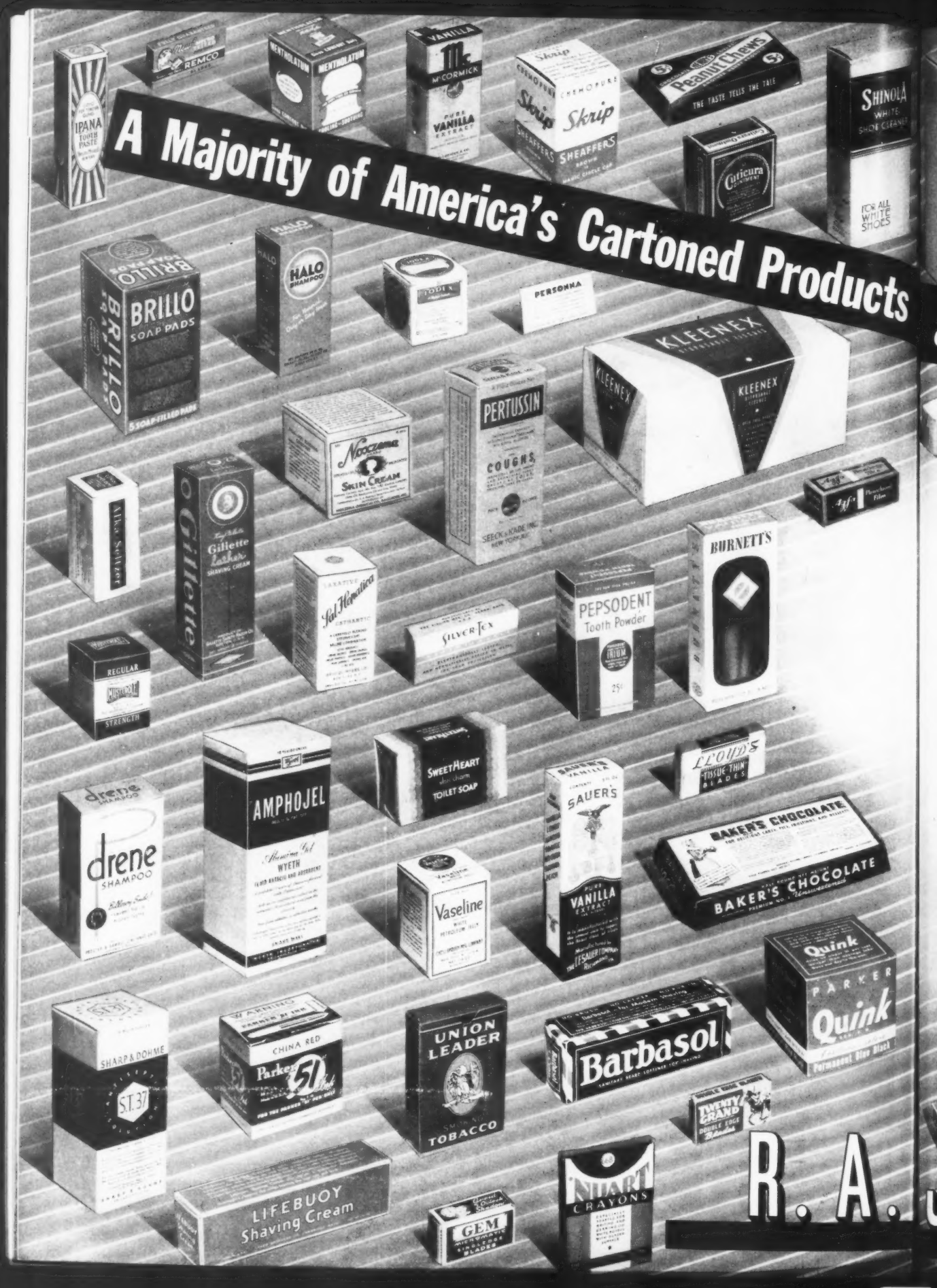
Please send complete data on ☐ Case Sealing ☐ Carton Filling and Sealing ☐ Package Weighing Equipment.

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A Majority of America's Cartoned Products
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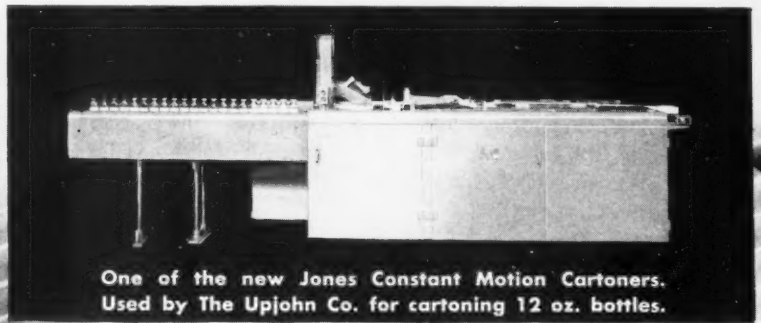
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Faster, Smoother Automatic Cartoning

Twenty-seven years of specializing in designing and building cartoning machines enable us to give you the most trouble-free, positive, profitable machine for your product.

JONES CONSTANT MOTION CARTONERS fold and insert leaflets and booklets; feed and insert protective corrugated liners; tuck or glue ends of cartons; print or stencil code or lot numbers; feed and count small articles from hoppers or magazines; are convertible to different sizes of cartons and loads in 15 to 30 minutes.

Send us a sample of your product and let us show you a Jones machine in operation on a similar item.



One of the new Jones Constant Motion Cartoners. Used by The Upjohn Co. for cartoning 12 oz. bottles.



JONES & COMPANY, INC.

P. O. BOX 485 CINCINNATI, OHIO

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UNICRAFTS, INC. is proud to announce early deliveries of our "Deluxe" model Rotogravure Tandem Printing Press and other models. This tried and proven press incorporates all the most up-to-date features developed during the war. Delivered in 1 to 6 colors in any width up to 72".

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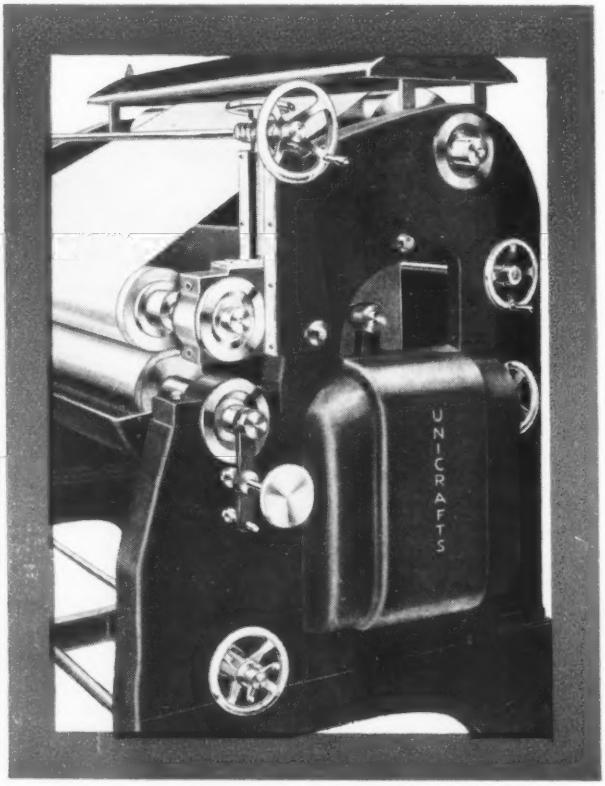
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LATEST DESIGN DRYING EQUIPMENT

HYDRAULIC CONSTANT TENSION UNWIND

NEW TYPE VARIABLE SLIP BELT REWIND

MANY OTHER ADVANCEMENTS



STRESSING

HIGH SPEED

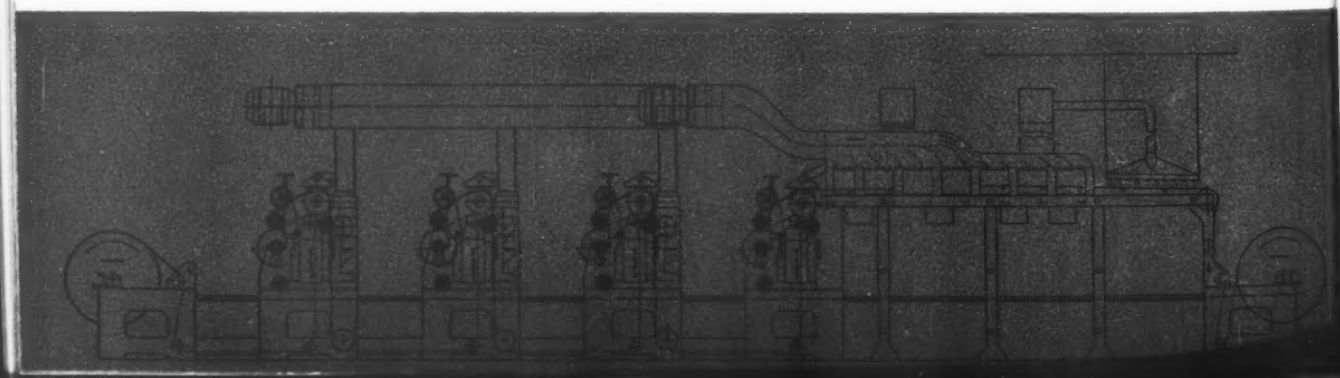
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ECONOMY

LOW MAINTENANCE THROUGH USE OF ANTI-FRICTION BEARINGS

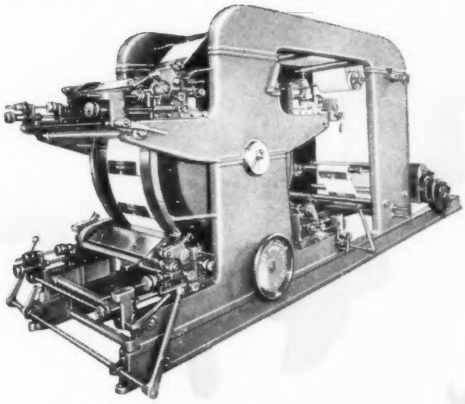
• Our line includes other models of Gravure Printing Equipment, Laminating and Coating Equipment, Embossing Machines and Special Equipment. We also supply engraved rolls of all types and copper steel or aluminum roll blanks for engraving.

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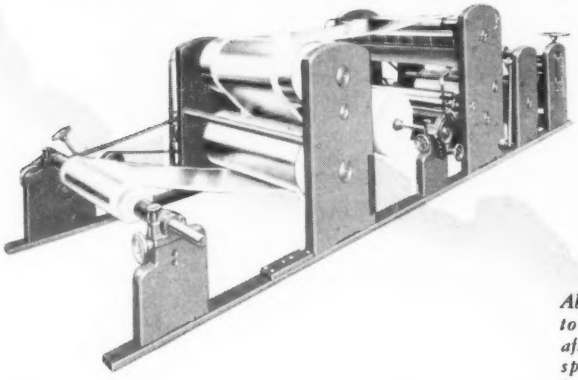




FROM COAST TO COAST



satisfied users prefer Hudson-Sharp machines for better Printing, Coating, Laminating and Embossing



Above: No. A-4 Aniline press for high speed printing up to four colors in rotation. Artificial drying required only after all colors are applied — the last word in quality, speed and proven production. Left: No. WL-2 Wax laminator machine for coating or laminating foils, cellophanes, papers and light boards with waxes, microcrystallines and hot melts. Machine built in any width 30" to 65". Single or double applicators — rewinders optional.

HUDSON-SHARP paper converting equipment has set a new standard of performance not only in America but in foreign countries as well. Our varied line, so wide in scope, incorporates the most advanced mechanical features to produce improved quality and uniformity of products. High speed performance, economy of operation and minimum maintenance assure you of lower production costs and savings so essential to profitable operation.

If you are not familiar with our converting equipment, we suggest that you write us for further information. The popular demand of customers everywhere for Hudson-Sharp machinery is taxing our production facilities to the utmost. We hope that you will anticipate your needs and place your orders just as soon as possible to avoid disappointment.

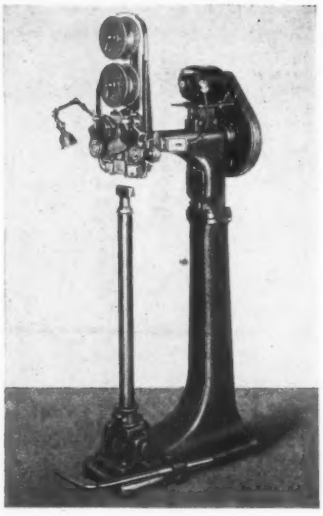
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Manufacturers of
Printers, Embossers, Folders, Interfolders, Waxers, Laminators, Wrapping Machines, Core Winders, Packaging Presses, Crepers and Napkins, Toilet Tissue and Paper Towel Units.

BOTTOM STITCHERS



Bliss Heavy Duty Bottom Stitcher

Equipped with Bliss Heavy Duty stitcher head. Recommended for stitching the bottoms of regular slotted containers, and other types of one piece boxes and many other purposes, where maximum production is required.
The rugged construction of the Bliss Bottom Stitcher assures long service on heavy duty work.
Built in three sizes: 15″, 25″ or 33″ throat.



Bliss Heavy Duty Duplex Stitcher

Drives two stitches simultaneously, enabling a production 50% to 60% greater than is possible with the single head stitchers, without increasing the labor cost. One operator can stitch 6 to 12 boxes per minute. With two operators, production may be increased to as many as 18 boxes per minute.
Built in one size with 15″ throat length.

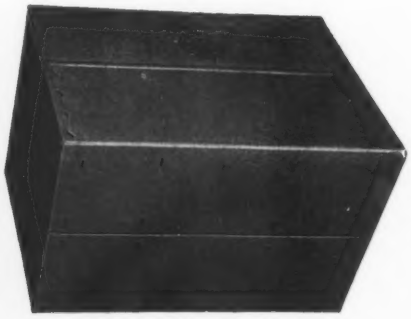


Bliss Box and Bottom Stitcher

This is a general purpose machine popular in plants using both regular slotted containers and various styles of telescope and Bliss boxes. Boxes can be assembled on the box arm; regular slotted containers can be bottom stitched on post. Change can be made in one minute.
Built in two sizes, with 15″ or 25″ throat, respectively.



Boston Portable Bench Stitcher

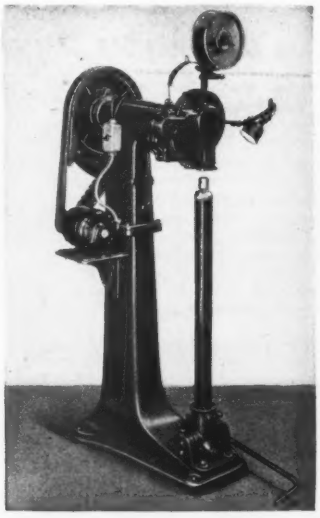


Regular Slotted Container, showing bottom stitched on Bottom Stitcher

With this Boston Portable Bench Stitcher, you will often find it more convenient to take the machine to the work to be stitched than to carry the work to the stitcher. The machine is intended for light stitching operations, such as sealing filled bags by wire stitching, attaching articles to cards, and making small boxes. Baking companies use this machine extensively for sealing, and for stitching labels to their packaged goods.

The Portable is readily carried from one location to another, attached to a light socket and put in operation without delay. It is electrically tripped by means of a solenoid operated by a foot pedal or attached to the stitcher arm.

Stitches work up to $^1/_4$″ in thickness, and has a throat length of 4″. Uses #26-D Stitcher head, for 25 to 30 round wire. Crown $^3/_8$ or $^1/_2$″ as order. Motor $^1/_{20}$ HP.



Improved Latham No. 34-B Bottom Stitcher

A moderately priced stitcher for bottom stitching the lighter grades of corrugated and solid fibre shipping containers in all the usual sizes. Heavy duty working parts are larger and stronger than those of previous Latham models. Formers and drivers are readily removable and reversible. Stitcher head is removable as a unit. Reliable Boston ring type clutch.
Uses .017 or .020 ribbon wire; No. 1 or No. 2 Hybar wire. Crown of stitch, $^7/_{16}$ inch. Throat, 12″. Speed up to 300 stitches per minute. $^1/_4$ HP motor.

DEXTER FOLDER COMPANY
330 West 42nd Street, New York 17, N.Y.

TOP STITCHERS



Bliss Combination Top and Bottom Stitcher

This combination machine is used both for bottom stitching and top sealing. It is intended for plants whose production does not warrant installation of separate Bottom and Top Stitchers. For assembling cases by bottom stitching, the blade anvil is dropped down against the pedestal and the table is swung to one side, the post is placed in a socket on the base and locked in position.

After the desired number of containers has been bottom stitched, the post is removed and table and blade anvil swung into position for top stitching. Less than one minute is required to make the change.

The work table is fitted with ball bearings on which the box may be easily moved in any direction. The table is counter-balanced and is quickly and easily adjustable up or down by hand, for boxes of varying heights.

Built in two sizes with 15″ and 25″ throats, and 26″ x 30″ work table. Handles boxes up to 25″ in depth. The standard Heavy Duty Stitcher Head is used. Motor, 1/4 H.P.

Machine may be equipped with casters for moving about the plant.



Bliss Power Lift Top Stitcher

Recommended where large numbers of heavy containers are used and is especially suitable for conveyor installations, as it is adjustable to coincide with conveyor line.

Equipped with a power driven work table. Table automatically stops in just right position for top stitching. One motor operates power lift and stitcher. A steel work table equipped with steel ball bearings permits free movement of container while being stitched.

Equipped with Bliss Heavy Duty Stitcher Head.

Built in one size, with 33″ throat length. Table size 26″ x 40″.



Top Stitched with overlap in center

SOLENOID CONTROL FOR STITCHERS

A recent improvement which may be applied to any type of machine except bottom stitchers is the substitution of electrical for mechanical control. In the mechanical type the clutch is engaged and released by a foot pedal mechanically connected. The electrical control employs a movable floor switch actuated by slight pressure of the operator's foot, and the clutch is engaged by the action of a solenoid mounted on the frame of the stitcher. When the foot is removed from the switch the solenoid ceases to act, and a spring releases the clutch.



Illustrating Solenoid Control

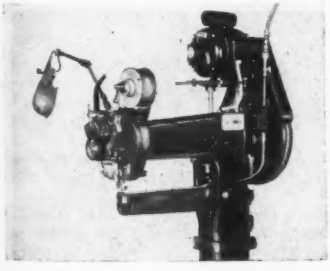
Among the advantages of this type of control are:

1. The switch may be placed in any desired position which is advantageous when large blanks are being stitched, or when the operator works in seated position. Can be arranged for foot or hand operation, and in some cases may be tripped by the article to be stitched.

2. The operator's foot does not have to be raised as high from the floor, and the foot pressure required is less than where manual control is employed, both of which factors reduce fatigue.

3. The operation of the clutch is more positive.

This type of control is optional on all Bliss stitchers at a small additional cost.



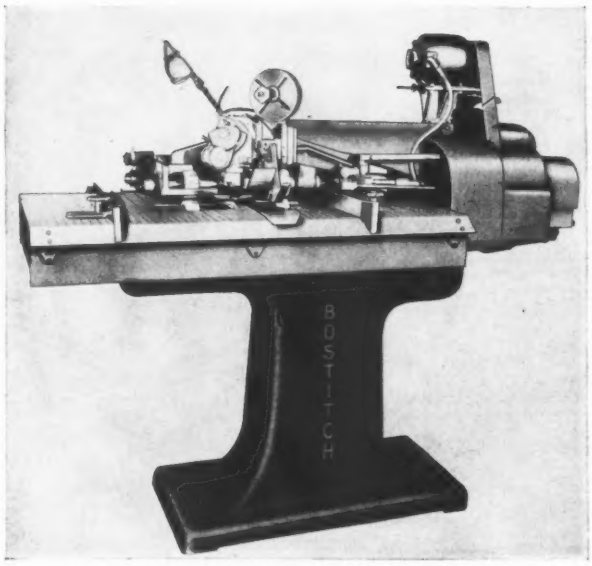
BLISS AIRCRAFT STITCHER

Fibre, fabrics, plastics, rubber or other materials may be wire stitched to metal with the Bliss Aircraft Stitcher. Two pieces of aluminum, steel or non-brittle metals, or two sheets of metal interlined with fabric or other soft material come within the range of wire stitching. The stitch punches a clean hole through the metal, and legs of stitch clinch flat against the metal.



DEXTER FOLDER COMPANY
330 West 42nd Street, New York 17, N.Y.

BLISS AUTOMATIC REGULAR SLOTTED CONTAINER STITCHER WITH DEXTER ELEVATOR



Bliss #485 Automatic Stitcher



Dexter Elevator Attached to Bliss Stitcher

Shipping container manufacturers recognize the economies of automatically wire stitching the seams of corrugated and solid fibre shipping boxes. The wire stitched joint as produced by the Bliss Automatic Stitcher and Dexter Elevator is inexpensive, dependable, and improves the strength of the box. This reliable joint is unaffected by moisture or other unfavorable conditions in storage or transit. Containers treated for waterproofing or made of specially treated liners are much stronger when joined with this positive wire stitch seal.

During the past four year period a greatly improved automatic stitcher, which will accommodate a larger range of box sizes and box boards, has been developed and thoroughly field tested. You can expect higher production from the improved Model 485 machine which drives stitches at the rate of 400 per minute. The machine will drive a single row of stitches, or a single row with tie stitches at the top and bottom of the joint. Range of stitches 3 to 35 inclusive. Operated with $^3/_4$ h.p. electric motor. Machine will handle all single wall board and double wall board construction up to A. & B. It will accommodate standard solid fibre board from .060 to .120 thick. Average time required for adjustment of machine from one size of box to another—five minutes.

The automatic stitcher is operated in connection with the Dexter Heavy Duty Elevator, which is now furnished to handle a load of 2,000 lbs. of flat blank material. This Model C.E.H. Dexter Elevator is fitted with a conveyor table 70″ long and 30″ wide and will handle maximum size blanks approximately 90″ x 40″. The feeding height of the pile is kept at a constant position through an electric control finger. Operated with a $^1/_4$ h.p. motor attached to the lighting circuit.

The operation of this unit of equipment in most plants is as follows. A pile of blanks up to $3^1/_2$′ in height is rolled from your conveyor system on to the Dexter Elevator Table. The operator who stands in front of this pile, folds the blanks and inserts the box into the feed rollers of the stitcher. These rollers pick up the blank and carry it quickly through the stitching process. As the operator folds and feeds the boxes, the Dexter Elevator automatically raises and keeps the top of the pile at a constant feeding level. When the last box is folded, the elevator is then dropped to its bottom position where another pile is moved into place.

Better quality and uniformity of folding is obtained through the use of the Dexter Elevator. Besides this, the productivity of the stitcher is increased between twenty and thirty percent.

Certain special slotted containers, die cut boxes and half slotted containers can be stitched with standard equipment. Special attachments will be available for stitching corrugated and fibre tubes.

The outstanding features of the Bliss Model #485 Automatic Stitcher are as follows:

1—Massive and sturdy construction designed for box making.
2—High speed and quiet running operation.
3—Quick and positive setting of machine.
4—Increased productive capacity due to high speed of machine and ease of feeding boxes into feed rollers.
5—Squaring of short depth flexible type boxes.

In addition to their increased strength, containers with wire stitched joints cost less when stitched with a Bliss Automatic Stitcher and Dexter Elevator. Only one operator is required. The cost of stitching wire is a very nominal item, averaging five to six cents per thousand stitches.

PARTS, WIRE AND MECHANICAL SERVICE

Dexter branch offices in New York and Chicago carry a stock of replacement parts for Bliss, Boston and Latham Wire Stitchers, and are prepared to render prompt and efficient service on any of these makes of stitchers.

A stock of all of the usual sizes of box stay and bookbinder's wire is available at all offices for prompt shipment.

Orders for rebuilding Bliss, Boston and Latham stitchers are solicited.

BLISS BOXES

Bliss style boxes are the strongest shipping containers obtainable because of the reinforcement of all four vertical joints by wirestitched flanges. They may be made of solid fibre or corrugated board as desired.

These boxes are used regularly by manufacturers of shoes, cereals, meat, canned goods, bottled beverages and many other products.

The blanks for Bliss boxes are readily obtainable from the leading board mills and box factories in the United States and Canada. Machines for conveniently and economically assembling Bliss boxes are furnished by Dexter.

DEXTER FOLDER COMPANY
330 West 42nd Street, New York 17, N.Y.

5 Outstanding Packaging Developments BY PALMER



SIFTPROOF CARTONS . . .

More acceptable to the consumer, Palmer siftproof cartons provide *added* protection and strength. Absolutely siftproof and constructed with board-saving simplicity, they are easily filled on high speed Palmer machines soon available—fully or semi-automatic. One-piece ends, recessed or flush, are permanently sealed into the side walls; body can be made with any type of side seam, including "tear-away" opening flap on any panel. Same construction is well suited to many liquid and semi-liquid products.



PAPER MILK CONTAINERS . . .

Built to stand more punishment and give more protection against leakage than most other containers, this Palmer product offers many indispensable features. All seams and flaps are sealed thermoplastically for liquid-tightness. The convenient dispenser, designed for both drinking and pouring, is completely shielded until the container is opened by the consumer, thus meeting sanitary requirements. The flat top and bottom permit easy stacking in the refrigerator or in cases. Flat cartons may be formed, waxed, filled and sealed in the dairy plant on Palmer machinery soon available; also, preformed cartons will be available for subsequent operations in the dairy.



ICE CREAM PACKAGES . . .

These sealed, leakproof cartons contain less board material, have features more appealing to the consumer, both as dispensers and storage containers. Formed, filled and sealed entirely by machinery, Palmer liquid-tight packages save labor and time in the ice cream plant. The automatic machinery (soon available) operates in conjunction with the freezing unit at equivalent speed.



FROZEN FOOD CONTAINERS . . .

Tightly constructed Palmer cartons with heat-sealed liners have been formed by Palmer machinery in frosted food plants for several years. The interiors, wholly sealed against the transmission of air and moisture, have proved their moistureproof qualities under most exacting conditions of use. Also available now is Palmer machinery for forming and closing cellophane-lined locking style containers, and for forming and closing sealed recessed end containers.



SIFTPROOF PAPER BAGS . . .

Packaging with thermoplastically sealed, flexible containers provides operating advantages, including economy in time and savings in materials and in labor. The tight-sealing process requires only heat and contact. Made and filled at speeds up to 100 per minute, Palmer siftproof multi- or single-wall bags are constructed in a variety of sizes, with or without pouring features. Palmer machinery for making and filling these bags is available.

PALMER
CHICAGO

Kindly address all inquiries to . . . . . FRANK D. PALMER, INC

528-34 NORTH WESTERN AVE., CHICAGO 12, ILLINOIS

DESIGNERS AND BUILDERS OF SPECIAL MACHINERY

XUM

Packaging Machinery That do

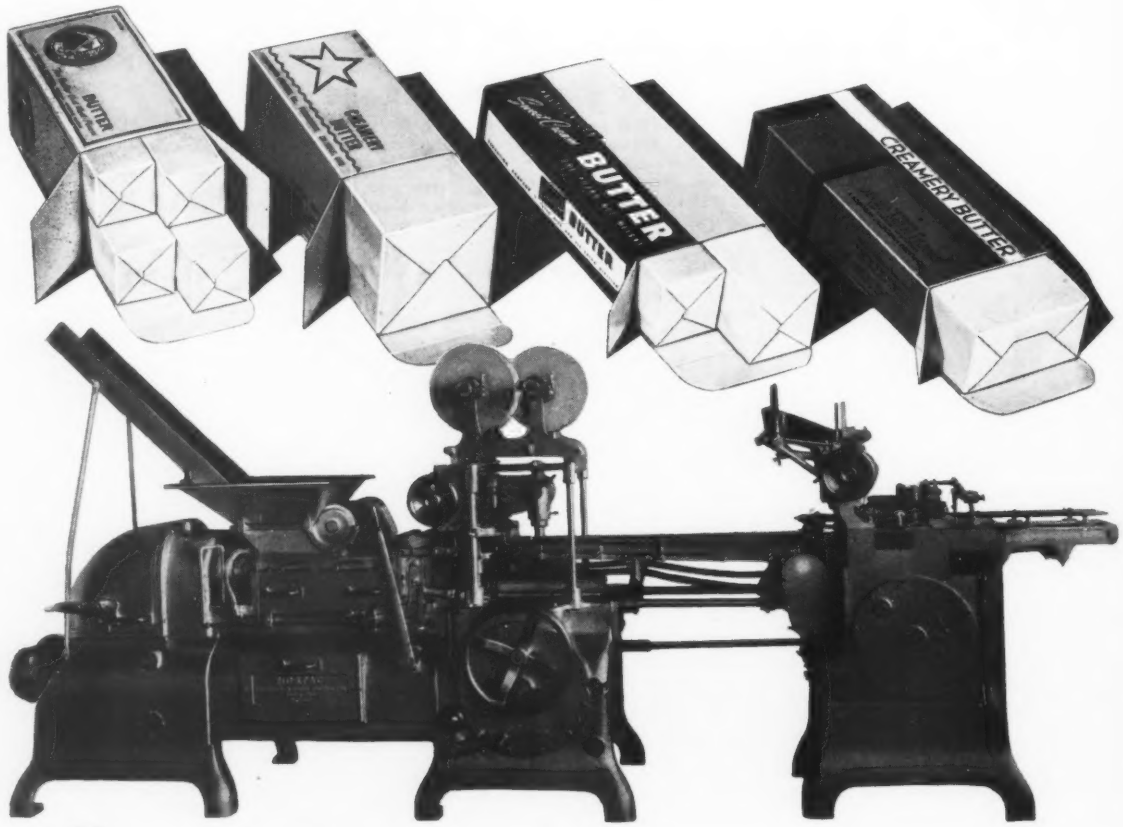
MORPAC

. . . for Butter, Oleomargarine and Allied Products . .

MORPAC automatically molds individual prints of butter or oleomargarine, in one pound or quarter pound sizes, Elgin or Western style, wraps with parchment, and places into cartons at speeds up to 3600 pounds per hour. All prints are uniform in weight to within 1/16 oz. per pound.

Simplicity of design and streamline construction make cleaning and sterilizing an easy task and all parts contacting product are of stainless alloy metals . . . meets extreme sanitation requirements of State and City boards of health.

Step up print room production, cut packaging costs to the bone, improve package appearance, *Do a better packaging Job . . . with MORPAC.* Write today for more complete details on Morpac packaging machines.



Lynch Package Machinery Corporation

TOLEDO 1, OHIO, U. S. A.

XUM

does a better Packaging Job!

WRAP·O·MATIC

. . . for Wrapping Candy Bars, Biscuits and Cookies

WRAP-O-MATIC wraps soft, fragile or irregular shaped (including squares or rounds), candy bars, biscuits and cookies into neat, trim, sealed packages that radiate quality and sales appeal. Its high speed wrapping of up to 120 units per minute affects a savings in wrapping labor as much as 80% and up to 35% in wrapping material. Shape and texture of the product are no obstacle, neither is the type of wrapper, for Wrap-O-Matic handles glassine, cellophane, foil or any wrapping material that can be printed in rolls.

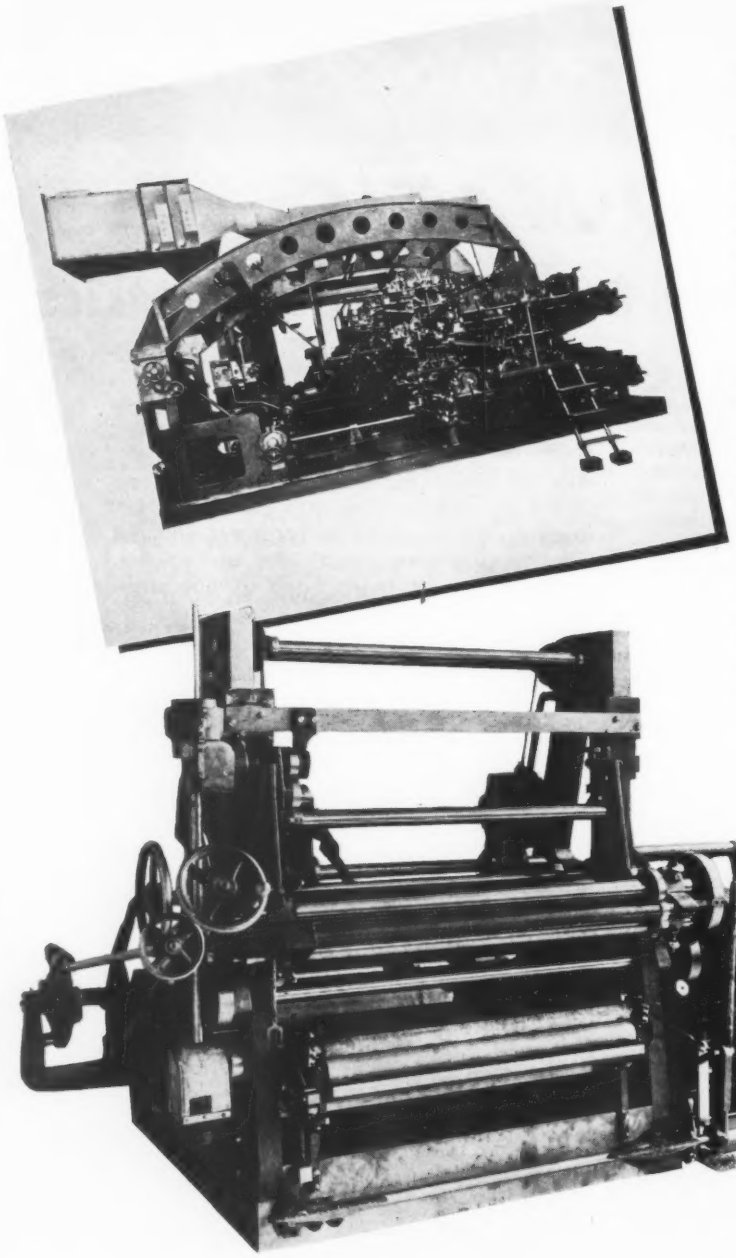
Let us show you how Wrap-O-Matic can dress up your product with that "Buy Me" appeal, reduce your wrapping costs and step up your production, sales, and profits. Write today for your copy of our illustrated brochure.



Lynch Package Machinery Corporation

TOLEDO 1, OHIO, U. S. A.

XUM



KIDDER ANILINER

A new aniline-type press for multi-color printing on decorative papers, cellophane, glassine, foil, Kraft, etc. Model shown is the STANDARD Aniliner, with drying equipment. Features: all-electric web tension device, metered ink fountains, ink pump and ink level control, unique fountain drive, improved drying system for all webs, foolproof system of plate cylinder disengagement.

ANILINE PRESS MODELS

Standard Aniliner — 4 color frames. Widths: 30″, 42″, 52″

Master Aniliner — 6 color frames. Widths: 30″, 42″, 52″, 65″

"*Celloprinter*" — 4 color frames. Widths: 24″, 30″

OTHER KIDDER "3 POINT" PRESSES

Multi-color Letter Presses: Interchangeable cylinders, latest engineering design. Widths: 65″, 72″

"*Unitype*" *Gravure Presses:* Individual units may be purchased as customer's production demands increase. Rewind delivery.

KIDDER SLITTER AND REWINDER

A new slitter and roll winder combining extreme accuracy with rugged construction. Model shown is the "Merchant" Slitter, available for shear or score cutting. Widths: 30″, 50″. A heavy-duty "Merchant" model is available in these widths: 60″, 70″, 80″.

OTHER KIDDER WINDERS

Super-Speed Sr. Faster, size for size, than any other winder ever built. Widths: 90″, 100″, 115″

Super-Speed Jr. Widths: 50″, 65″, 72″

C-W (center wind) Widths: 54″, 60″

KIDDER PRESS COMPANY, INC.

Printing Machinery, DOVER, N. H.



CONTROL OVER THE PAPER

PROPER DISTRIBUTION OF INK

ACCURACY OF THE IMPRESSION

KIDDER
THREE POINT
PRESS

KIDDER

Manufacturer of "3 Point" Presses — so-called because they fulfill the three major requirements for perfect printing.



BOX MAKING & PACKAGING MACHINERY

"SCOTT" NET WEIGHERS

For weighing and filling coffee, rice, peas, tapioca, spices, tea, soap flakes, crackers, etc. Speeds up to 45 per minute are obtained with one operator, and closest accuracy is maintained.



"BOND" POWDER FILLING MACHINES

Automatic or semi-automatic models for packing, gross weighing, or volume filling. For face powder, talcum, flour, soap powder, tooth powder, cocoa, etc., and paste materials. Speeds up to 120 per minute are obtained.



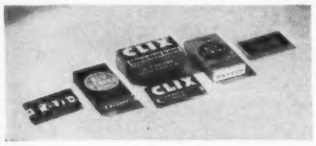
"MODEL C-10" CANDY & COUGH DROP PACKAGING MACHINE

Automatically opens flat carton, tucks bottom, cuts liner from roll, forms and inserts liner, counts and inserts candy, then tucks in and closes liner and top flaps of carton. Liner can be omitted when desired. Speed 60-100 per minute.



"MODEL C-21" HIGH SPEED CARTONING MACHINE

For samples and penny candy. Two magazines feed flat cartons to the opener, bottoms are tucked, and both are filled simultaneously, then the tops are tucked. Machine can be equipped for lining or wrapping or both. Speed 150 per minute.



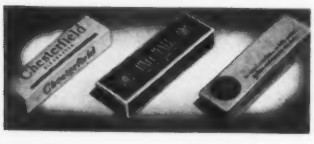
"MODELS C-2, C-20 & W-16" FOR WRAPPING & CARTONING RAZOR BLADES

C-2 Cartoner opens flat cartons, tucks in bottom, counts and inserts single edge blades and closes at 125 cartons per minute. C-20 Cartoner does same operations on double edge blades. W-16 Wrapper wraps and glues labels on single edge blades at 175 blades per minute.



UNIVERSAL "BRIGHTWOOD" BOX MACHINE

Fully automatic for making a wide range of different sizes of boxes at lowest production costs. It forms and glues turned-over end boxes from creased or scored blanks with or without double side walls, in addition to standard single end boxes, at speeds up to 70 per minute.



STANDARD "BRIGHTWOOD" BOX MACHINE

The Standard "BRIGHTWOOD" automatically glues and forms single wall boxes in a wide range of sizes and styles, such as two-piece with shallow or full telescope cover, one-piece hinge-cover, trays, etc. at speeds up to 60 per minute.

The boxes, containers, cartons, etc., shown above, merely illustrate some of the various types of packaging which are accomplished on U. S. Automatic machinery. Our files contain hundreds of such items—among these are packages like your own —this is the reason it is wise to come to U. S. first with packaging problems.

Send U.S. details on any of your packaging problems —we have the machines and the engineering background to help solve them.

U.S. Automatic Box Machinery Co. Inc.

Owning and Operating

NATIONAL PACKAGING MACHINERY CO. • CARTONING MACHINERY CORP.

18 ARBORETUM ROAD, ROSLINDALE, BOSTON 31, MASS.

Branch Offices: NEW YORK CLEVELAND CHICAGO
LOS ANGELES (KRUGH EQUIPMENT & SUPPLY CO.)

EQUIPMENT ∾ the key to Modern Packaging . . .

Today's successful modern packaging is a matter of equipment. High on the list of packaging equipment are scales. They should be EXACT WEIGHT Scales to protect your profits. These famous scales are in every major packaging operation in America from the smallest package to the largest . . . on every type of production line from simple hand weighing to completely automatic operations where speed and accuracy are the main specifications.

PRODUCTS—Quality pre-determined weight scales for modern packaging; automatic checkweighing, controlling automatics, hand weighing.

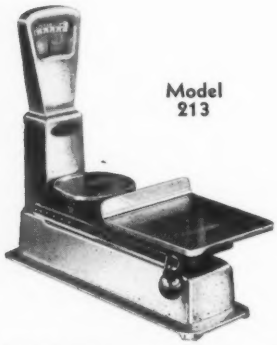
Model A-244



SELECTROL

Model A-244—A completely automatic checkweighing machine for direct insertion in any production line. Features 100% checkweighing of packages at speeds up to 120 units per minute with rejection from the line of all packages failing to meet weight requirements. Inherent stability of electronic interpretation means in combination with micro-movement weighing element allows for uninterrupted service through millions of weighing cycles. Weighing member oscillations damped through electronic circuit. Standard models in capacities from 1 oz. to 1 lb. with visual sensitivities beginning at 1″ per gram. Rejection accuracy better than one part in 1000. Available only for operation with power source of 110–120 volts, 50–60 cycle, single phase alternating current.

Model 213



Model 213—End Tower construction for fast multiple checkweighing operations. Fits any production line—is trouble-free in operation—ideal for present day small packages of dehydrated foods and drugs. Capacity to 3 lbs.



Model 8003



Model 8003—For small packaging of materials of high value. Features center tower construction with indicator travel registering extremely delicate over and underweights, which remove the last excuse for inaccuracy in all fine checkweighing operations—Capacity to 12 lbs.

The SHADOWGRAPH is a revolutionary advance in precision weighing. A light ray replaces mechanical indication to allow reduction in working parts thus producing greater accuracy and speed. Noiseless in operation—instantly ready to weigh by plugging into any electrical outlet. Featuring extremely fine sensitivity SHADOGRAPH is dependable and accurate in any high speed modern packaging operation.

Model 273



Model 273—End Tower construction completely changes all standards by which modern high speed over and under weight scales are to be judged. Features—Short platter fall which multiplies operating speed and this feature materially reduces scale depreciation—compactness—less space on the bench—fits any production line—uninterrupted straight line production across the scale—heavier construction for added ruggedness. Capacity 12 lbs.

Model 1304—EXACT WEIGHT "Iron Horse" for heavy duty weighing of pre-determined weight packages. Features rugged construction, short platter fall which eliminates much scale wear, long indicator travel on the dial, speed of operation, protected dashpots to eliminate foreign matter, working parts enclosed, weighing accuracy unaffected by out-of-level floors or machinery vibration. Accurate to 1 ounce over and under weight under full load—Capacity to 150 lbs.



INDUSTRIAL PRECISION

Exact Weight Scales

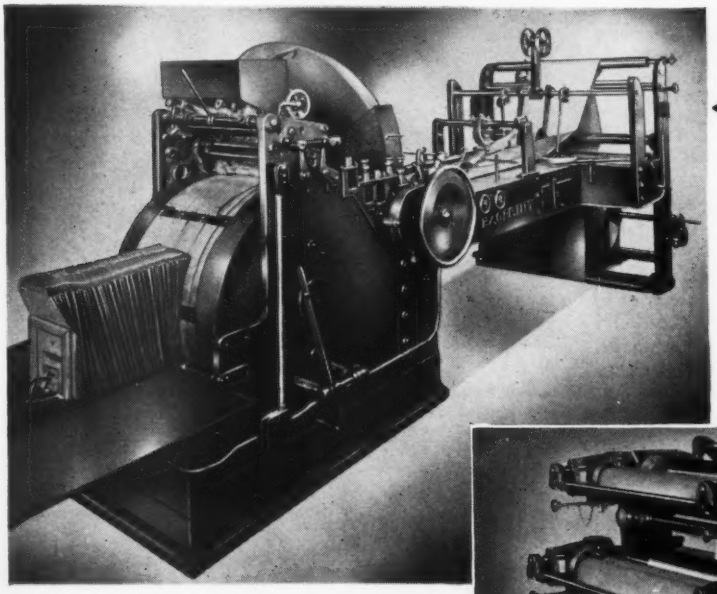
THE EXACT WEIGHT SCALE COMPANY

223 W. Fifth Ave. Columbus 8, Ohio
Dept. 1 783 Yonge St., Toronto, Canada

MACHINES FOR BAGMAKING

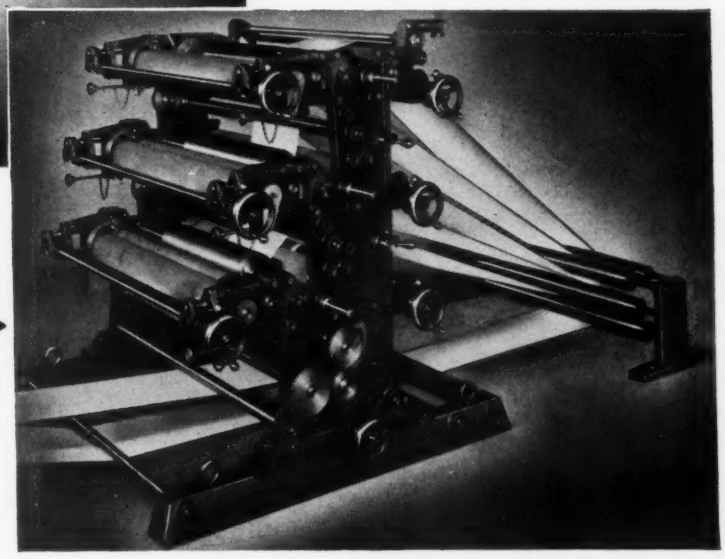
BAGPRINT HIGH-SPEED SPECIALTY BAG MACHINE
BAGPRINT HIGH-SPEED ANILINE PRINTING PRESS

- *Engineered for Maximum Production*
- *Greatest Bag-Size Range*
- *Minimum Change-Over Time*
- *Very Low Maintenance Cost*



The Bagprint High-Speed Specialty Bag Machines are a distinct advance in bag machine equipment. They are ruggedly constructed with heavy rigid frames, and with all important journals running in sealed, self-aligning, ball-bearings so that vibration is practically eliminated even at highest speeds. Fast, efficient, and time saving these machines will maintain a very high rate of continuous production with minimum of down time.

Available in two sizes—Bagprint Model B-10 and Bagprint Model A-18. Model B-10 will make flat and square paper bags from 2″ to 10″ wide and from 3½″ to 17″ long. Model A-18 will make flat and square paper bags from 3″ to 18″ wide and from 8″ to 25″ long.



The Bagprint High-Speed Aniline Printing Presses are modern in design and of rigid construction. Bagprint presses are precision-built machines with ball bearings throughout. Producing high-quality printing with no splash of ink. Especially designed for production with Bagprint High-Speed Specialty Bag Machines but can be used with any make bag machines or web-fed paper converting machines.

Available in two sizes—Bagprint Model A-30 and Bagprint Model A-48. Model A-30 will take a 33″ web and print on a 30″ surface. Model A-48 will take a 50″ web and print on a 48″ surface.

WRITE FOR DETAILED INFORMATION AND PRICES

BAGPRINT MACHINERY CORPORATION

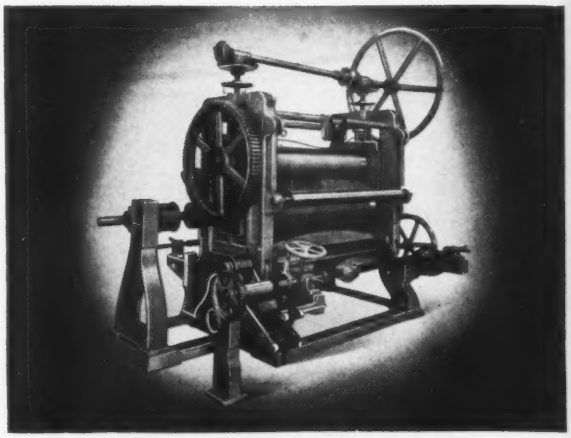
4363 Woodward Avenue **Royal Oak, Michigan, U. S. A.**

A Century and More of Engineering Experience

WALDRON
PROCESSING MACHINERY

ANILINE PRINTING MACHINES
ROTARY PRINTING MACHINES FOR ALL PURPOSES
COATING MACHINES
CREPEING MACHINES
EMBOSSING MACHINES
GUMMING MACHINES
LAMINATING MACHINES
PAPER ROLLS (EMBOSSING)
SATURATING MACHINES
SLITTING MACHINES
WAXING MACHINES
WINDING MACHINES
SPECIALLY DESIGNED MACHINES FOR PROCESSING PAPER

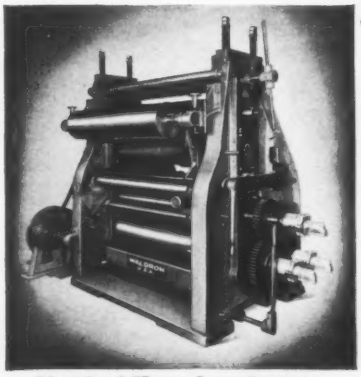
In its design and construction, every WALDRON machine reflects a background of engineering experience extending over a period of a century and more. Their design refinements, accurate proportioning and sturdy rigid construction combine to insure the greater output of finer quality products that has maintained the WALDRON position of leadership in the field of processing machinery. For every step in your processing, from raw stock to finished product, WALDRON can supply the right machine.



Centennial Embossing Machine

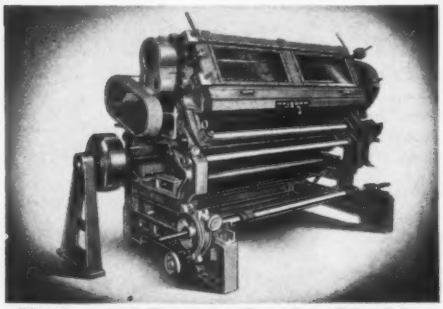
Sub frame permits quick change of design. Equipped with advanced pressure regulating and recording device for applying equal pressure on both sides of machine. Anti-friction bearings throughout. Automatic stop.

Whatever your requirements, if it is in connection with Paper Converting, use the facilities and service of our Engineering Department. Descriptive literature is available on request.



Vertical Type Laminator

New vertical design requires minimum of floor space. Applies any kind of adhesive smoothly without troublesome "ribbing." Combines paper, paper and board, cloth, regenerated cellulose.



Horizontal Reverse Coating Machine

Especially designed for applying quick drying lacquers or varnishes. Applies smooth, uniform coat. Ideal for metallic, lustre or waterproof coating on paper or fabric.



Decorative Printer

All purpose, for rotogravure, surface, direct or aniline printing. Interchangeable printing heads. Widths changed without lapping. Permits adjusting register without stopping machine.

JOHN WALDRON CORP.

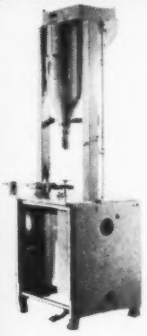
Main Office & Works – NEW BRUNSWICK, NEW JERSEY

BUILDERS OF QUALITY MACHINES SINCE 1827

XUM

S&S FILLING · PACKAGING · WRAPPING MACHINES

"Better Machines for Better Packages"

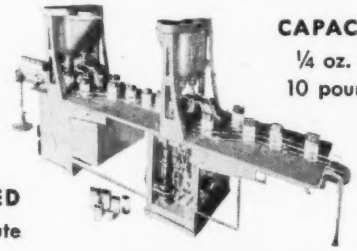


FILLING MACHINES

SEMI-AUTOMATIC
FULLY-AUTOMATIC
SINGLE and DUPLEX TYPES

FILLS
CANS • JARS • BOXES • CANISTERS

MATERIALS
Pastes — Powders
Granular Products
or any Free Flowing
Materials

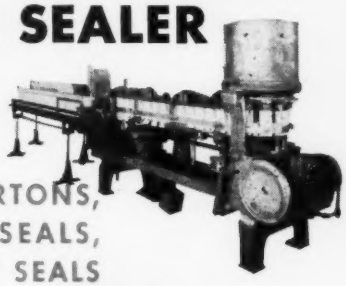


CAPACITY
¼ oz. to
10 pounds

PRODUCTION SPEED
15-30-60-120 per minute

NEVERSTOP CARTON FILLER and SEALER

Several Models



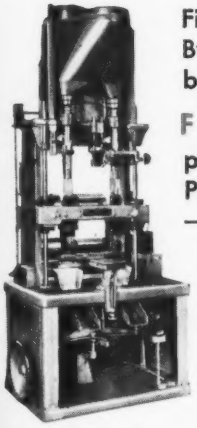
FEEDS CARTONS,
BOTTOM SEALS,
FILLS, TOP SEALS

MATERIALS
All Food and Grocery Products in Cartons

CAPACITY
Maximum Carton — 10½" x 6½" x 4½"
Minimum Carton — 2¾" x 1⅝" x ¾"

PRODUCTION SPEED: 40 to 120 per minute

TRANSWRAP PACKAGING MACHINE



Filling by measurement or counting. By auger or centrifugal feed—or, by hand feed.

FORMS • FILLS • SEALS
packages made of Cellophane, Pliofilm or other heat sealing films — *from the roll — plain or printed.*

MATERIALS
Coffee — candy — nuts — crackers — pills powders — individual pieces.

CAPACITY
⅛ oz. to 1 lb. — volume not over 56 cu. in.

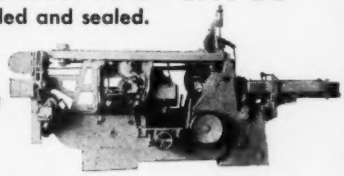
PRODUCTION SPEED
50 to 60 per minute

TIGHT WRAPPING MACHINE

Automatic

TIGHT-WRAPS CARTON
WITH PRINTED LABEL
after it is filled and sealed.

Makes attractive, siftless, tight-wrapped package



MATERIALS: All products in cartons

CAPACITY
Maximum Carton — 10" x 6½" x 4"
Minimum Carton — 3¾" x 1½" x 1"

PRODUCTION SPEED: 60 to 70 per minute

STOKES & SMITH Co.
Packaging Machinery — Paper Box Machinery
FRANKFORD, PHILADELPHIA 24, PENNA.

WRITE FOR LITERATURE

A Message to Bottlers and Packagers of Liquid and Semi-Liquid Products

Machines illustrated here exemplify the broad scope of U. S. bottling equipment in use throughout the world.

Our long experience in the manufacture of Bottling Machinery and in the engineering and installation of complete bottling plants is available to help you promote your reconversion requirements.

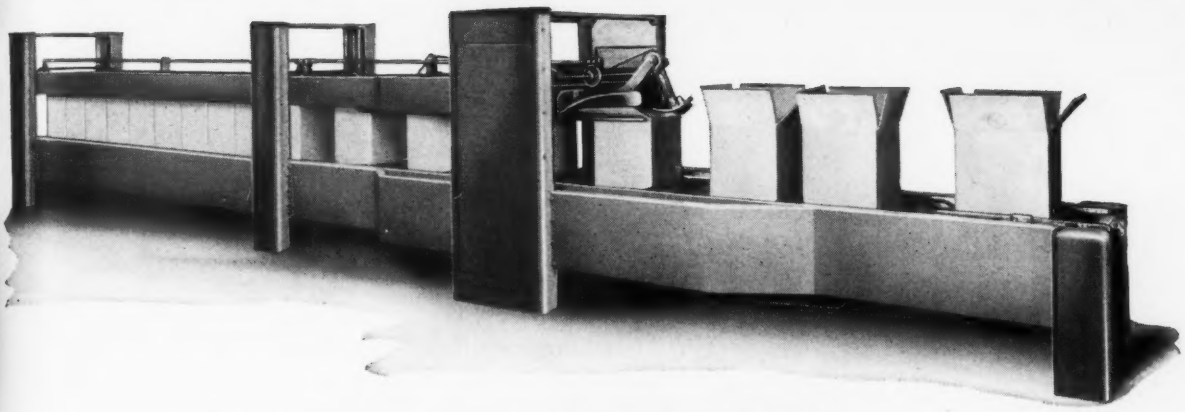
Some U. S. Hand and Semi-automatic equipment is available to cushion this period of reconversion and we are equipped to produce Fully Automatic Bottling Machinery as fast as availability of materials permits. The earlier you anticipate your needs, the earlier we can serve you.

U. S. BOTTLERS MACHINERY COMPANY

Bottling and Packaging Engineers

4015-4031 NORTH ROCKWELL STREET • CHICAGO, ILLINOIS

XUM

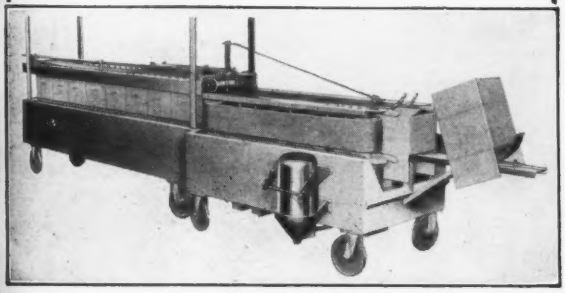


ABC Automatic Top and Bottom CASE SEALER

Modern s-t-r-e-a-m-l-i-n-e-d design. Requires no operator. Seals 30 cases per minute . . . both top and bottom, top only or bottom only. Finger-tip control. Extra-rigid construction that practically eliminates "down time" . . . low maintenance cost. Adjustable to 6"—18" width, 8"—30" length, 3"—28" height.

A B C *Semi-Automatic* BOTTOM CASE SEALER

Designed to seal the bottom flaps of empty cases. One operator required. Speed up to 18 cases a minute. Quickly adjustable to 6"–21" width, 6"–30" length, 3"–28" height.



Special Engineering Service

Packaging Machines correctly designed by thoroughly experienced engineers, and constructed to fit *your own* special requirements.



OTHER ABC PACKAGING UNITS

- Hand Gluer
- Semi-automatic Top Case Sealer
- Top and Bottom Carton Sealer
- Automatic Carton Sealer
- Cap Shrinker
- Tube Cut-off Machine

ABC PACKAGING MACHINE CO.
QUINCY, ILLINOIS

XUM

Sheet Plastic Fabrication

3/32" SUPERFLEX

1/8" RIGID

5/32" SUPERFLEX
SPECIAL

THERMOBEAD DUPLEX
TWO BEADS FORMED SIMULTANEOUSLY

GROOVE FOR CARDBOARD



1/16" FLEX

RECTANGULAR SIDING

SPECIAL SHAPES

LARGE CYLINDERS

SPECIAL BEADING TO ORDER

"THERMOBEAD DUPLEX"

DOUBLE EDGING MACHINE

SHEET PLASTIC FABRICATING MACHINES FEATURES

- A MODERN PRECISION TOOL BACKED BY 22 YEARS EXPERIENCE WITH SHEET PLASTIC
- CLEAN ECONOMICAL ELECTRIC HEAT
- BUILT-IN DIAL THERMOMETER ACCURATE ELECTRONIC HEAT CONTROL

OTHER TABER DESIGNED AND PRECISION-BUILT FABRICATING MACHINES FOR SHEET PLASTIC—

THERMOCREASE FORMS 90 DEGREE BENDS

THERMOFOLD FORMS TIGHT OR "U" FOLDS

THERMOSEAM FORMS AND CEMENTS LAP-JOINT CYLINDERS

THERMOCURL BEADS ENDS OF LAP-JOINT CYLINDERS

THERMODRAW AIR AND ELECTRIC PRESSES FOR DRAWN PARTS

SPECIAL EDGING DIES DESIGNED AND BUILT TO SPECIFICATION

WRITE FOR INFORMATION

Taber INSTRUMENT CORPORATION

NORTH TONAWANDA, NEW YORK, U. S. A.

DEPT. PC. - 111 GOUNDRY STREET

XUM



2W-6, America's most modern wrapping machine, hermetically heat or glue seals the wrapper for your product at a rate of 130 wraps per minute with perfect register. Only two operators required. Present machine is adjustable for products of various sizes up to 5" in length — or combined width and height of 4". Machines for larger sizes will soon be available. Forward samples of your product and wrap for quotations.

*WOMEN PURCHASE 85% OF ALL RETAIL MERCHANDISE

Campbell
WRAPPER

HUDSON-SHARP MACHINE CO. • GREEN BAY, WIS.
Manufacturers

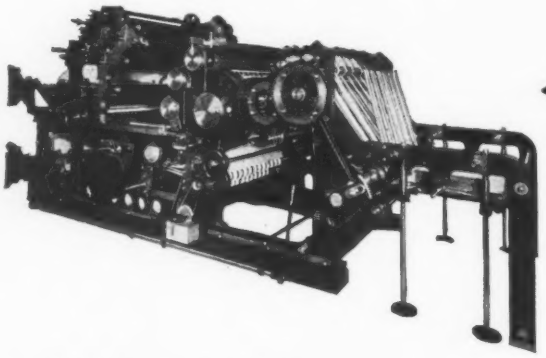
MEISEL

PRESSES SLITTERS SHEET CUTTERS

QUALITY SPEED DURABILITY MEISEL

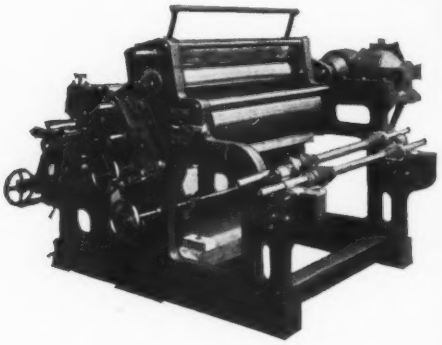
Reg. U.S. Patent Office

MACHINES FOR LAMINATING LABEL DIEING



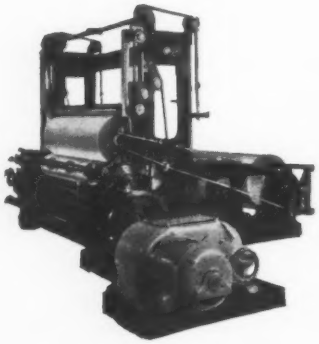
PRESSES

We build both rotary and bed and platen printing presses. These presses print from typographical plates both metal and rubber as also by offset and rotogravure systems. The multioperation rotary presses are built as fixed size, adjustable, all-size, and variable. These are patented. Several operations can be performed in one passage through the press.



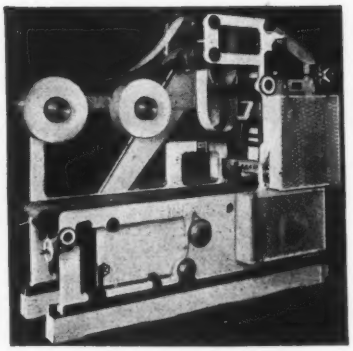
LAMINATING MACHINES

The laminating machines we build vary in size and weight to suit the materials to be combined. Hot asphalt as well as liquid adhesives and latex are used.



SLITTERS

Our models of slitters range from small to large and use the type of cut suitable for the material to be converted. Unwinds, rewinds, and drives vary to suit the models.



SHEET CUTTERS AND LABEL DIEING

The cutting of paper into sheets or into variformed outlines is done by an assorted group of machinery. Some do the cutting in connection with other operations. Maximum accuracy is maintained.

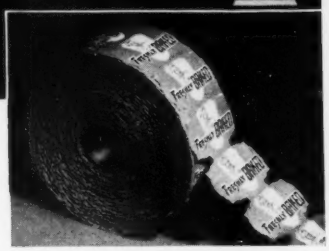
MEISEL PRESS MFG. CO.

944 DORCESTER AVE. BOSTON, MASS.

"Oliver" Wrapping Machine

AND ROLL-TYPE THERMOPLASTIC Labels





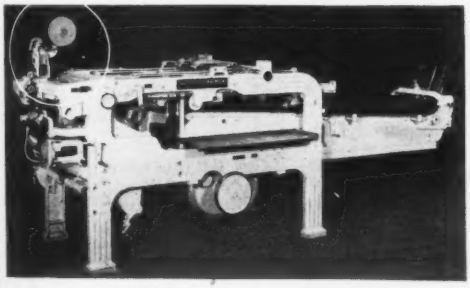
"Oliver" Thermoplastic Labels come in continuous rolls that synchronize perfectly with the "Oliver" Labeller. These multi-color diecut labels are produced in our own large, modern printing plant.

This Versatile Wrapping Machine with its Automatic Labelling System Cuts Costs, Speeds Production

The patented "Oliver" Roll-Type Labeller automatically heat-seals colorful diecut labels *from rolls* to your packages. These rolls of labels are easy to stock, easy to change, and *low in cost!*

The Labeller securely heat-seals one label at a time in almost any desired position on the package. The label is detached from the roll just before it is affixed to the wrapper. "Oliver" Labels can be heat-sealed to any type of wrapping material—cellophane, wax, glassine, paper, etc. And your code, and other essential information, can be imprinted on the label just before it is attached.

Today hundreds of leading manufacturers, food processors and super markets are using the "Oliver" Wrapping Machine with its new Labelling System at amazing savings in time and money. Discover what the "Oliver" can do for you. Get all the facts on this automatic Wrapping Machine and the Roll-Type Labels today.



"OLIVER" AUTOMATIC WRAPPING MACHINE

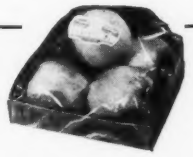
Wraps cakes, cookies, fresh vegetables, fresh fruits, dried fruits, meats, cheese, frozen foods, textiles, paper napkins, etc.—in cartons, trays, U-boards, flat cards or without supports.

Most versatile, easy to adjust

Handles widest range of sizes

Automatic Cardboard Folder and Feeder

Made in five different size ranges. Wraps rectangular- and odd-shaped articles. Easily adapted to your special needs or variety and production. Quickly adjustable without change of parts. Change from "end-fold" to "underfold" instantly. Automatic paper stop. Self-centering paper roll holders. Automatic coding of labels, cards, cartons. Offered with 6′, 9′ or 12′ infeed conveyor for assembly work. Photoelectric registration of printed wrappers. Strong hydraulic thermostatic sealing. Automatic Labeller and Label Coder shown in circle.



For Wrapping Fresh Produce

—for self-service from open-top refrigerated cases. Title, weight, price, code automatically imprinted on label just before it heat-sealed to wrapper. If interested in packaging fresh produce and meats for self-service, call on the experience of "Oliver" engineers.

A girl can operate the "Oliver"

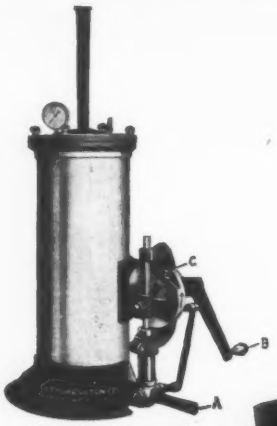


For Complete Information Write to the

OLIVER MACHINERY COMPANY

PACKAGING DIVISION GRAND RAPIDS 2, MICHIGAN

XUM



No. 3 Hand Paste Filler



Hand Tube Closer



Foot Power Crimper

COLTON

HAND OPERATED MACHINES

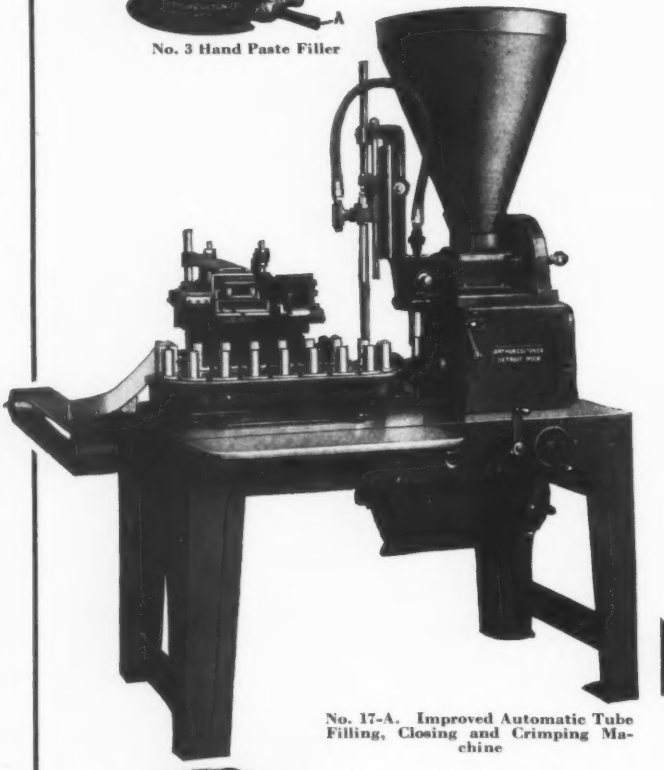
No. 3 Collapsible tube filler (hand operated) for tubes up to 1″ x 5½″ long.

Hand operated tube closer made in two sizes and styles to seal tubes with the Colton Clipless Closure or to seal tubes for applying clips.

Foot operated crimper for applying final corrugation to the closed end of the Colton Clipless Closure which gives it a decorative appearance as well as greater rigidity to the closed end of tube.

We also furnish this same machine without the crimping jaws for applying clips.

Our catalog No. 11 illustrates a variety of fillers and closers to suit production required. Please make us acquainted with your requirements and capacity, and we will be pleased to recommend machines best suited for your purpose.



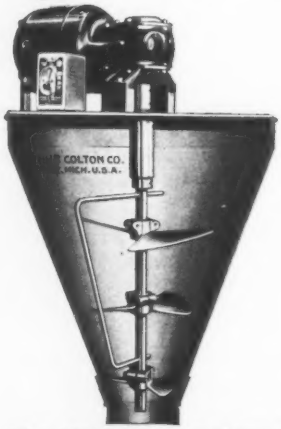
No. 17-A. Improved Automatic Tube Filling, Closing and Crimping Machine

YOUR IMMEDIATE ATTENTION IS CALLED TO THIS NEW No. 17 IMPROVED AUTOMATIC TUBE FILLING, CLOSING & CRIMPING MACHINE for SEALING COLLAPSIBLE TUBES. TYPE "A" for PASTE. "B" for POWDERS. "C" for LIQUIDS.

The famous COLTON CLOSURE machine has been greatly improved and simplified. It now offers you these new advantages:

1. **Motor is underneath, out of the way.**
2. **Equipped with REEVES drive for speed control.**
3. **New design filling head gives a positive free smooth action of nozzle.**
4. **Start and stop push button switch.**
5. **Two hand levers. One for starting the machine proper. One for stopping and starting filling mechanism.**

Write today for a sample tube and full information on this machine.



Electric Drive Stirring Device as shown is recommended for materials that do not flow readily in our standard hopper

ARTHUR COLTON CO.

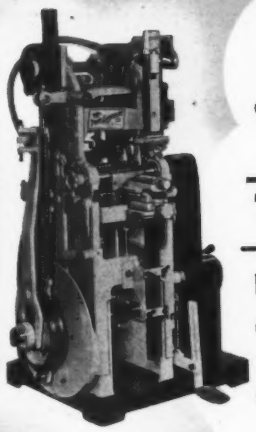
2602 JEFFERSON AVE., EAST
DETROIT, MICHIGAN

XUM

LABELING EQUIPMENT

for AMPULES - BOTTLES - JARS
JUGS - CANS - PAPER BOXES, Etc.

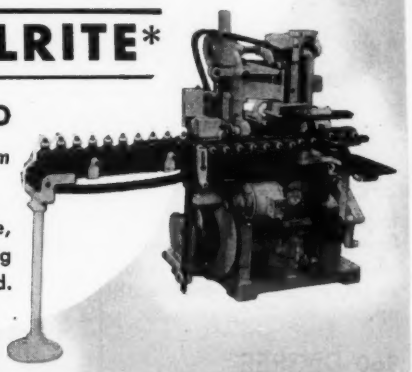
as well as products including radio tubes, tools, books, socks, etc.

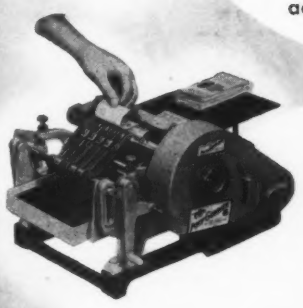


The PONY LABELRITE*

For HAND or AUTOMATIC FEED

- PERFECT REGISTER, because of the *vacuum principle* of label handling.
- FULL SURFACE GLUING *without glue seepage,* because of the *twin-roller method* of distributing adhesive and positive control of amount applied.





*The "Pacemaker"** TABLE GUMMER

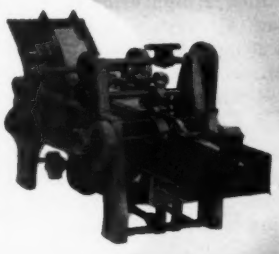
for applying adhesive to labels on SHORT RUNS

Substantially built for long, economical service; with *micro-glue adjustment* and control, and Self-Cleaning device. Also includes the Twin-roller gluing method, with patented pick-offs that can be readjusted to compensate for wear.

FOR IMPRINTING CODE NUMBERS ON LABELS

CODE-O-MATIC*

The Code-o-matic imprints batch, code and control numbers on rectangular labels at speeds up to 250 per minute, for Quality and Inventory Control and Product Liability Purposes. Tiny, legible type. Eliminates perforation and all its drawbacks. Speedily provides a day's supply of labels.



*REG. U. S. PAT. OFF.

NEW JERSEY MACHINE
CORPORATION

1525 CLINTON AVENUE — **HOBOKEN, N. J.**

325 W. Huron Street, Chicago, Ill. — **1701 Carew Tower, Cincinnati, Ohio.**

XUM

10 YEARS IN THE MAKING

Speedry

ROTOGRAVURE *at its best*

SPEEDRY—
Improved design sealed ink fountain features side removal of cylinder and inking mechanism, eliminating press wash-up.

360 DEGREE RUNNING REGISTER CONTROL—
Hair line register, motor and gear controlled by push button or electric eye.

CONTROLLED IMPRESSION PRESSURE—
Micro - accurate pressure to parts of a pound. Motor or hydraulic powered with visual gauge.

LO-TEMP. DRIERS—
New Champlain individual driers using a high velocity balanced air system that dries inks at amazingly low temperatures.

WEB CONTROL—
Unique breaker roll design that permits raising and lowering impression cylinder without affecting tension or register.



TEN YEARS IN THE MAKING
The majority of important practical improvements in commercial rotogravure have been originated and developed by Champlain, its users and associates.

CHAMPLAIN has the "KNOW HOW"
Champlain, with its wealth of experience and engineering knowledge, substantiated by so many successful installations can best offer the conversion and printing trades a simple, efficient and profitable Rotogravure Printer.

CHAMPLAIN
STANDARD ROTOGRAVURE

CHAMPLAIN COMPANY, INC. • 88 LLEWELLYN AVENUE, BLOOMFIELD, N. J.

THE BEST OF Everything IN LABELING AND CASING EQUIPMENT

Chisholm-Ryder

COMPANY OF PENNSYLVANIA

HANOVER, PENNSYLVANIA

NEW WAY LABELING MACHINES

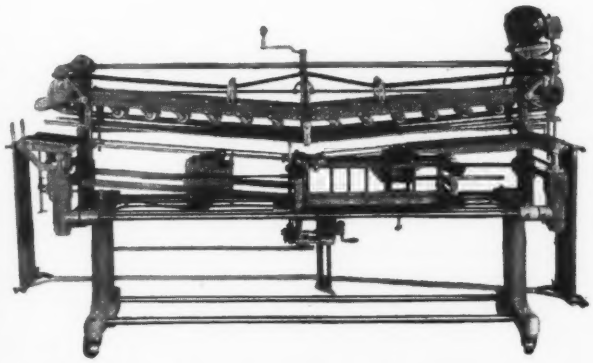
Rugged Construction to assure you of years of constant operation . . . .

Easy-Maintenance Features to minimize shutdowns for servicing . . . .

It has often been said of CRCO-New Way Labeling Machines that they will satisfactorily and speedily label any container of cylindrical shape that will roll.

Many are in constant use today on special containers such as those used for one and two-pound coffee packs, bleach bottles in all sizes from pints to gallons, wide-diameter squat cans, jugs with handles, half-gallon and gallon containers with bale ears . . . as well as for all standard cans or jars.

CRCO-New Way Labelers are available in two models, adjustable or non-adjustable . . . with spot-labeling attachment, timing device, automatic can markers and many other attachments.



MODEL MH—A short-frame model to label from quarter-pints to quarts or any intermediate size. The non-adjustable Model MH will handle any one size container ranging from 1¾″ to 4⅜″ diameter to 1¾″ to 9″ in height. The adjustable Model MH will handle all size containers within the same range.

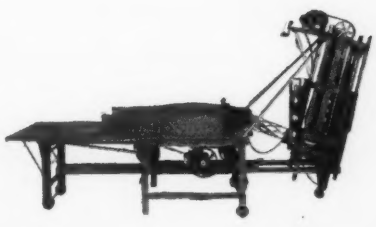
MODEL PG—A long-frame Labeler which gives in one machine the ability to handle the entire range of containers from ¼-pint to gallon. The non-adjustable Model PG will handle any one size from 4⅜″ to 6 11/16″ diameter and from 2″ to 9″ in height. The adjustable Model PG will handle all size containers from 2″ to 6 11/16″ diameter by 2″ to 7″ in height.

COMPARE THESE FEATURES:

- Precision-built throughout, with all parts machined.
- Patented aligning device keeps labels centered at all times.
- 27-inch width permits using in narrow aisles.
- Less lap-end paste required.
- Enclosed glue pot prevents contamination of gum.
- Thermostatic heat control assures positive maintenance of temperature.
- V-belt carriers run on beads of cans, preventing an accumulation of pick-up gum.
- Enclosed drives packed with grease minimize noise and wear.
- Patented extra long revolving seaming pad.
- Timing device for use with containers having bale ears and for jugs with handles.
- Can be equipped with CRCO-New Way Can Marker.
- Fully adjustable models permit range of containers from 1¾″ to 6 11/16″ diameter by 1¾″ to 9″ high.
- Can be supplied for all-around or spot labels.
- Three simple changeover adjustments: handle to set diameter, handle to set for height, handle to set glue pot—each operation indicated by vernier scale.

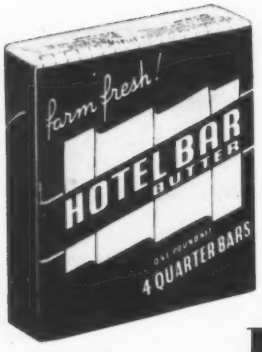
NEW WAY ASSEMBLING FEED TABLE

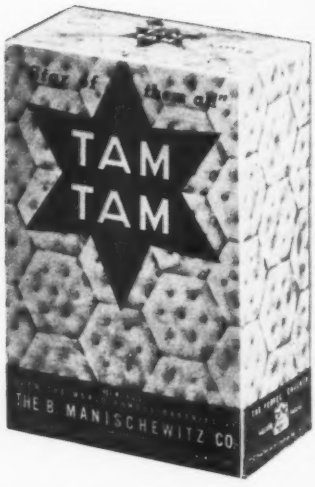
CRCO-New Way Assembling Feed Tables permit an operator to unload up to 150 containers per minute from trays or cartons. The carton is dumped on the table and pushed on the moving feed rollers which carry the containers to the revolving disc. Here they are automatically discharged in a single line and pass from the disc in a straight line to the labeler. Will handle metal or glass containers varying from 2 11/16″ to 4¼″ in diameter by 2½″ to 7½″ in height. Special models are available for long-neck bottles.

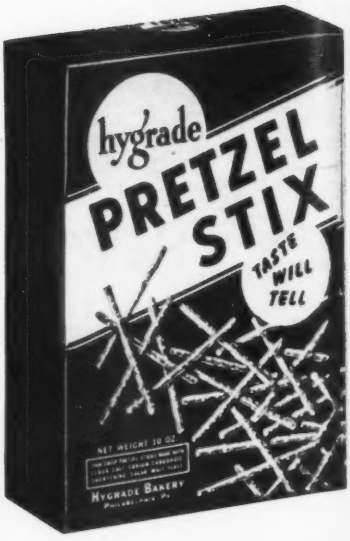


CRCO-New Way Assembling Feed Tables are available in hand-feed or automatic feed models, with single or double discs. Either right-hand or left-hand delivery can be provided and Feed Tables can be purchased with elevators (as illustrated) or as straight Feed Tables. They can be equipped with chutes to permit unloading and assembling containers direct from retorts or fillers and, in the double-disc models, can be equipped to supply an even flow of containers to two labeling machines. The smooth, even flow is invaluable in overcoming glass breakage.

XUM







HAYSSEN PACKAGING







Planned for Better Results

In addition to good design, careful selection of colors and first class printing, it is necessary that the overwrap give the final touch of excellence to complete the picture. How it is placed around the package and sealed, can add to or detract from the distinction your package deserves. Therefore, for more than thirty-five years the Hayssen Mfg. Company has produced machines to handle the problem of perfect overwrapping to meet specific requirements. This experience is at your service. If you are interested in obtaining complete information on Hayssen machines and how they can be of tremendous help to you, write the factory today. You'll be under no obligation, of course.

HAYSSEN MFG. COMPANY, Sheboygan, Wis.

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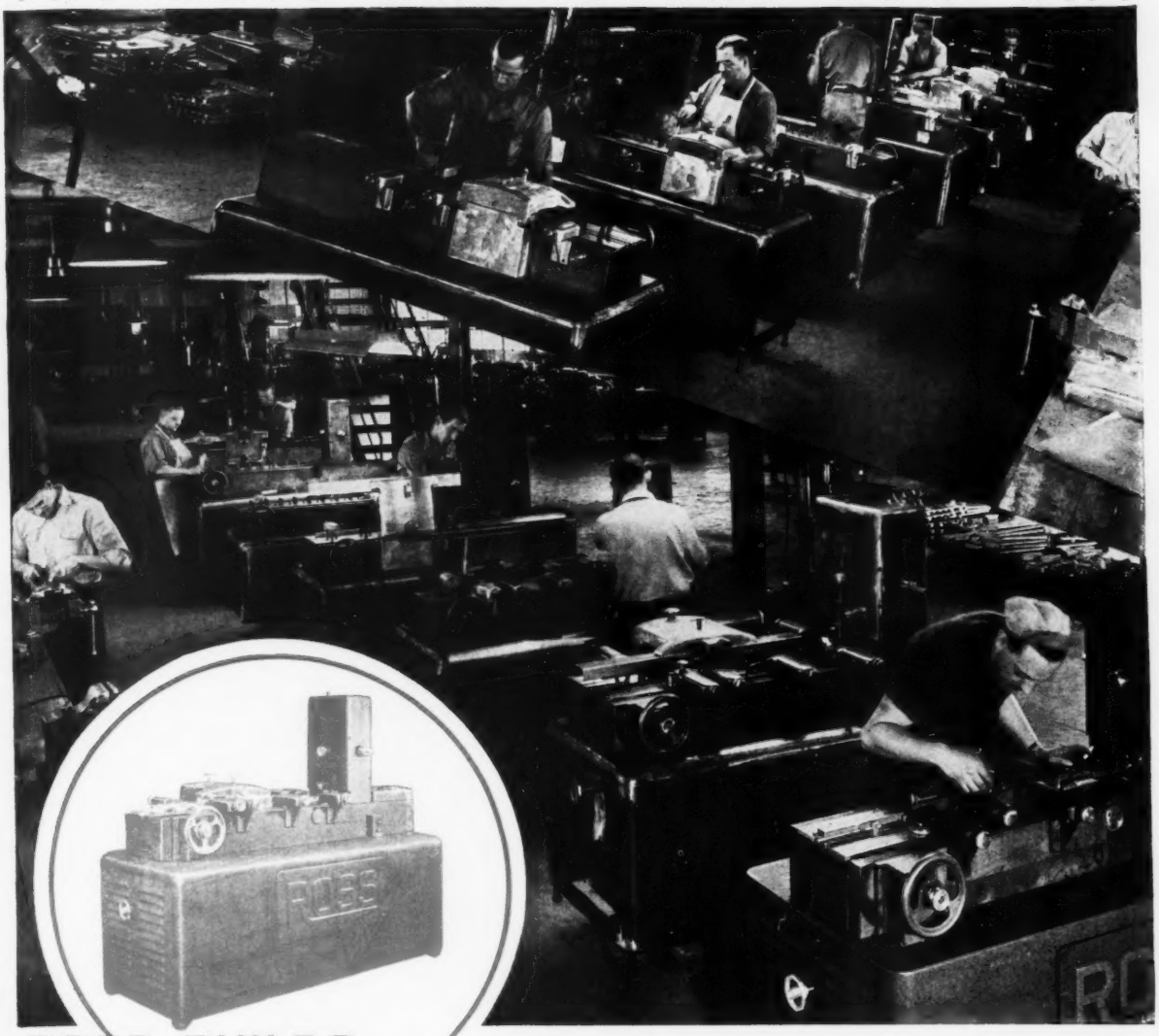
● Low capital investment ● Simplicity of design ● Fully automatic ● Low upkeep cost ● High speed wrapping with variable speed change ● Fully adjustable ● Perfectly wrapped packages ● Photo-electric cell registration ● Small frame machine, built in various sizes ● Thermostatically controlled electric sealing ● Always dependable ● Only one attendant, man or woman.

◆◆◆

HAYSSEN ELECTRONIC CONTROLLED **WRAPPING MACHINES**

XUM

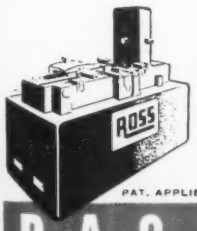
THE ROSS WAY IS THE NEW WAY



ROSS BUILDS *standardized high precision packaging machinery on a production line basis*

ROSS automatic and semi-automatic cartoning machinery is unique in the industry. Functional streamlining, engineered for precision adjustments, with all parts machined with fixtures and jigs, insuring complete interchangeability.

Assembly line production using standard, precision built parts, eliminates future replacement problems — eliminate prolonged "downtime".



PAT. APPLIED FOR

A. H. ROSS and Co.

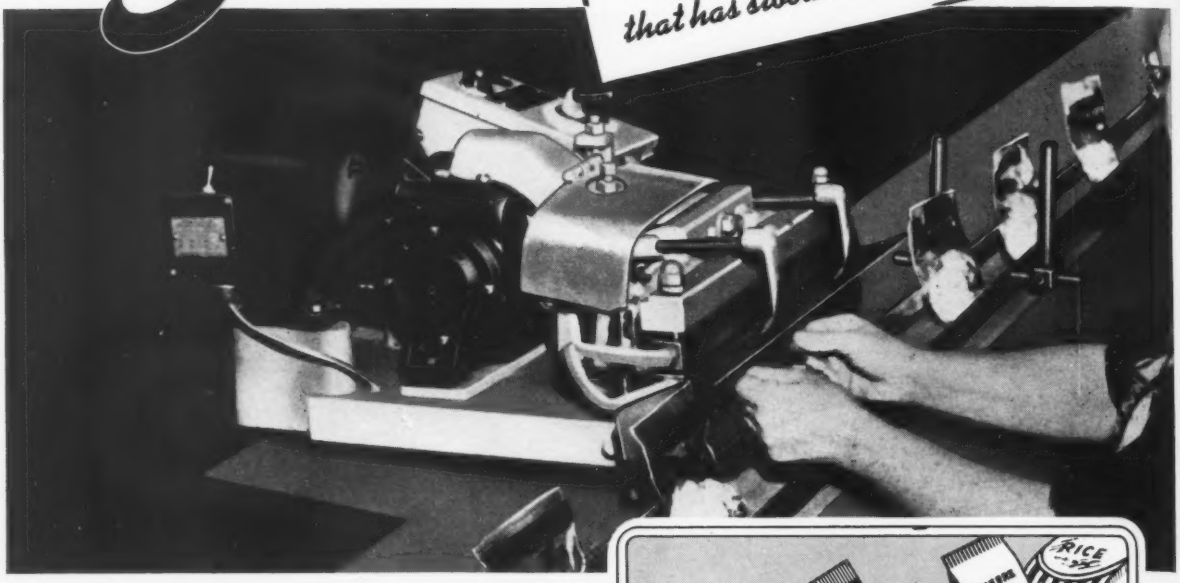
LUDLOW · KENTUCKY

PRECISION PARTS · SELF OILING · DIAL CONTROL
VERSATILE ADJUSTABILITY · MASTER SPEEDRANGER

PACKAGING MACHINERY

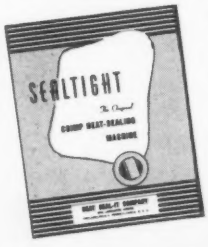
Sealtight

THE HEAT SEALING MACHINE
that has stood the test of time



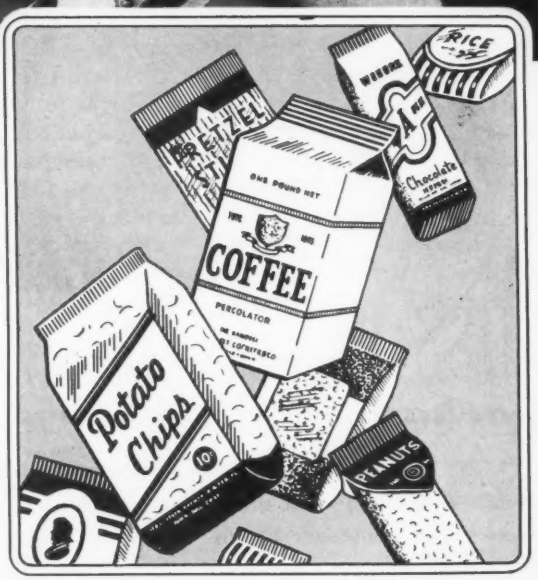
For thirteen years, the Heat Seal-It Company have specialized exclusively in the production of heat sealing equipment, of which we were the original pioneers. Because of our great experience and the time-tested efficiency of Sealtight machines, the list of Sealtight users today reads like a "Who's Who" of American industry.

There is a Sealtight model for every need—large or small . . . a machine for every purpose. Sealtight machines have many exclusive features not available in other equipment. Feel free to call on our technicians for advice in solving your heat sealing problem.



WRITE FOR CATALOG

For a complete picture of the best heat sealing equipment, write today for our general catalog. There is no obligation.



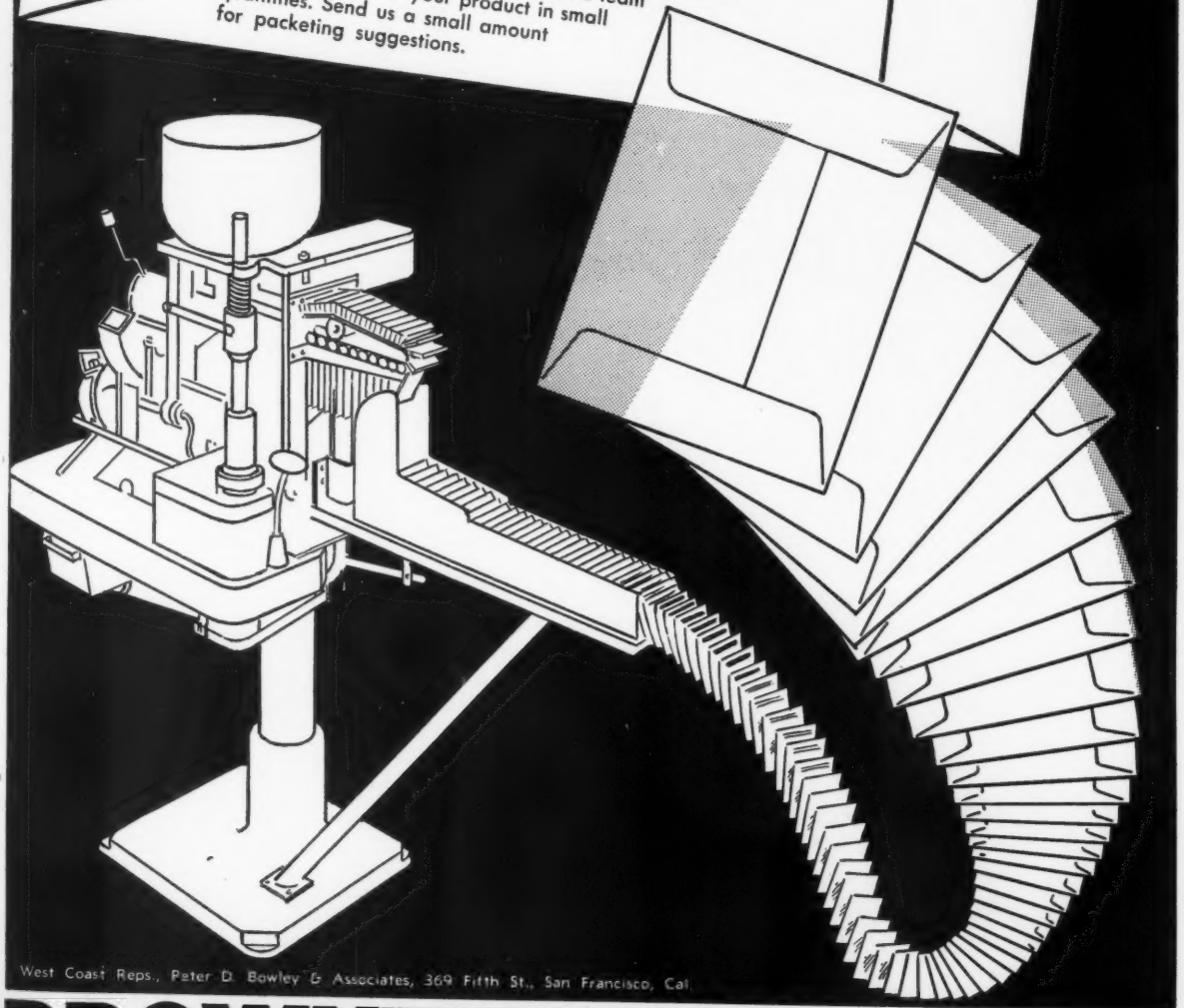
Sealtight will seal any type of heat sealing bag material from the lightest-weight cellophane to the heaviest laminated foils. There is a special model for large bulky bags and another for thermoplastic-coated bags. Send us your bag to seal without obligation.

HEAT SEAL-IT COMPANY

4316 LANCASTER AVE., PHILA. 4, PENNA.

BROWN PACKETING...
OPENS NEW PROFITABLE MARKETS

Wherever food, drugs and cosmetics are sold, Brown packets have established themselves independently as volume sales builders. Any product in the form of powders, pills, granules, or dry, free flowing materials, colorfully packaged in handy, individual Brown packets, attracts new and more customers. These packets lend themselves particularly well to display counters, racks, tables and shelves or as introductory samples easily attached to larger packages. Let us show you how Brown packets and packeting equipment are profitable team mates in the sale of your product in small quantities. Send us a small amount for packeting suggestions.

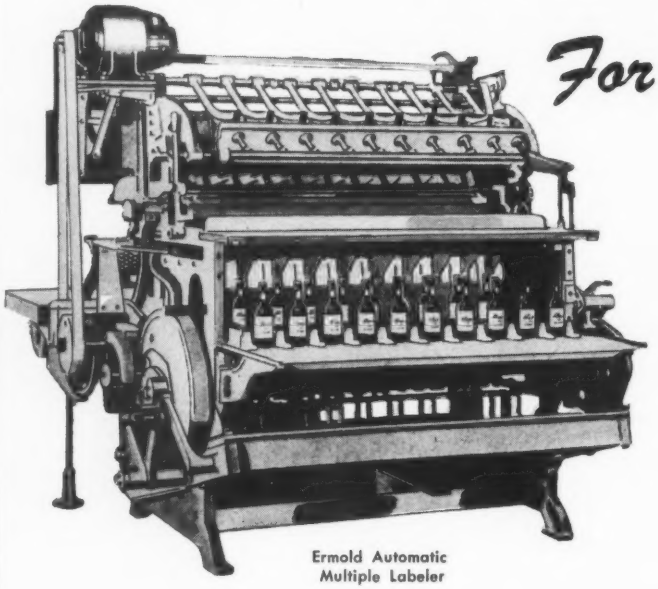


West Coast Reps., Peter D. Bowley & Associates, 369 Fifth St., San Francisco, Cal.

BROWN BAG FILLING MACHINE COMPANY FITCHBURG MASSACHUSETTS

Manufacturers of Open End Envelopes, Packets and Packaging Machinery

ERMOLD LABELERS



Ermold Automatic Multiple Labeler

For the Long Run

There's nothing like the Ermold Automatic Multiple Labeler to give you high output at low speed — as many as 12,000 an hour at only 20 cycles per minute!

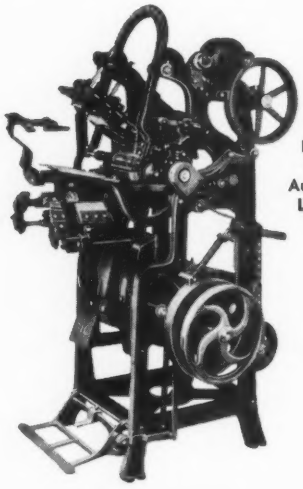
Because of its exclusive multiple principle, it doesn't have to race at a breakneck pace . . . 4, 6, 8 or 10 bottles or jars are labeled *at one time.* And lower operating speed, added to the machine's rugged construction, is reflected in minimum maintenance costs, machine jamming and bottle breakage.

One operation applies body and neck labels and foil . . . on sizes from splits to quarts. Other advantages include easy changeover from one size bottle or jar to another and label dating or coding at no extra cost.

. . . or the Short Order

It's the versatile Ermold Semi-Automatic Labeler for short runs on a wide range of container sizes and shapes. Regular, three-quarters and all-around labels can be applied—cleanly, uniformly, precisely—to containers from 15-drop ampules to gallon jugs. Simple, easily adjusted attachments make for quick shifting from one size to another.

Body and neck labels and foil can be applied at one time. And because it's easy to operate and service, you don't need an expert mechanic. Average output is 40 containers per minute, but may be higher depending on the speed of the operator.



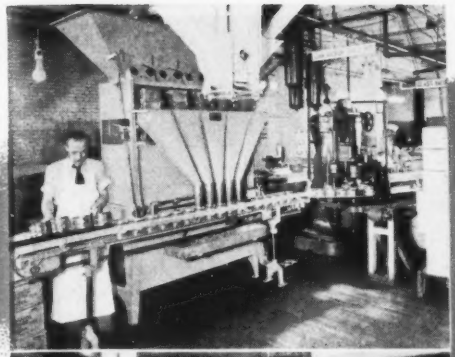
Ermold Semi-Automatic Labeler

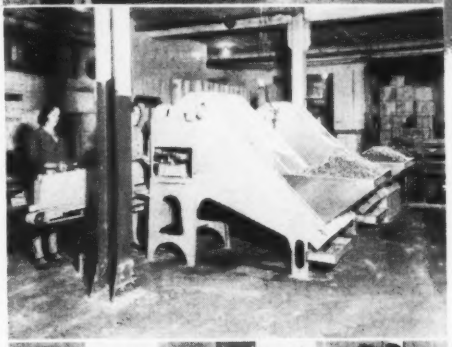
Durable in construction, reliable in operation, Ermold Labelers are backed by more than 65 years of specialization in labeling machinery. That's why so many leading breweries, wineries, bottlers and distilleries . . . as well as packers of food, chemical, pharmaceutical and hardware products . . . rely on them to meet production schedules at low per-unit cost. Find out how an Ermold can help *you* do a faster, more economical labeling job. Edward Ermold Company, 652 Hudson Street, New York 14, N. Y.

Over 65 years of labeling leadership . . . EDWARD Ermold COMPANY

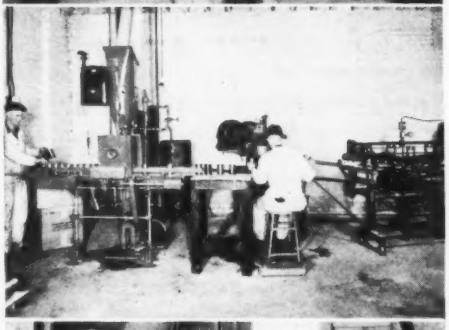
COFFEE PRETZELS GROCERIES LYE SPICES

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TRIANGLE
Planned Packaging

WEIGHERS - FILLERS - CARTON SEALERS
AUGER PACKERS FOR MORE EFFICIENT
PACKAGING OF ALL DRY PRODUCTS

Triangle makes over 60 types of machines, for packaging everything from frozen rivets to marshmallows. Triangle equipment takes the headaches out of packaging by increasing production, saving labor and producing more attractive packages. No matter what dry product you package, what type of container you use or what your production requirements are—Triangle can help you. For complete information, send a sample filled package and state production required.

Offices in New York, 230 Park Ave., 50 Church St.; Denver, 1525 Wynkoop St.; Cleveland, 5927 Euclid Ave.; Birmingham, 901 S. 38th St.; Los Angeles, 1501 W. Jefferson Blvd.; San Francisco, 111 Main St.; North Quincy, Mass., 139 Elliott Ave.; Dallas, 6530 Robin Road; Memphis, 710 South 4th St.; Montreal, Canada, Griswold & Co., Ltd., 407 McGill St.; Mexico City, Mexico, D. F. Equipo. Mecanico Industrial Cadiz, No. 176.

WRITE FOR NEW 20 PAGE BULLETIN

TRIANGLE PACKAGE MACHINERY CO.
908 NO. SPAULDING AVENUE, CHICAGO

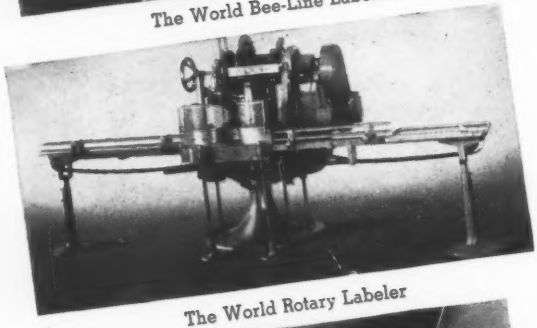
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WORLD LABELERS

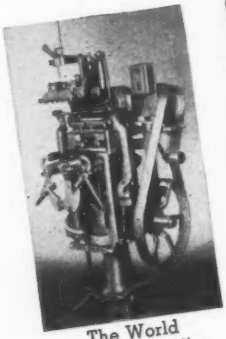
You get the best Labeler in the "WORLD", whether your job calls for continuous mass production, limited output or frequent changes of container or label sizes and shapes.



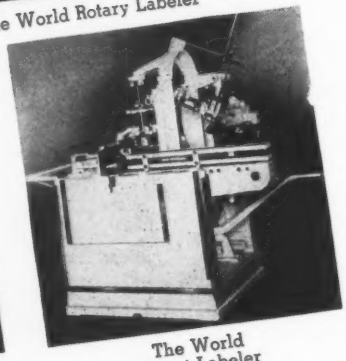
The World Bee-Line Labeler



The World Rotary Labeler



The World Semi-Automatic Labeler, Model S



The World Turret Labeler

THE WORLD BEE-LINE LABELER is for superb, firm, precise application of front or front and back body labels — and neck labels simultaneously if desired — to round, square, oval, flat or panel containers. It conducts them swiftly, continuously and gently through the entire operation in a bee-line, without stops, detours, collisions, jars or jams. It is ideal for the modern light weight glass. THE MODEL HG BEE-LINE does equally fine work on production labeling of gallon and half-gallon jugs and bottles. THE WORLD BEE-LINE MODEL 120 LABELER (pictured at left) is equipped with twin labeling stations to handle two bottles simultaneously while maintaining the same efficient labeling speed as the single station BEE-LINE LABELER, MODEL 65.

THE WORLD ROTARY LABELER is WORLD'S most dependable labeler for economical production labeling of all kinds of round bottles up to 4" diameter. It applies body labels, body and neck labels, or foil, singly or in one operation.

THE WORLD TURRET LABELER is for superfine, precision labeling of smooth, fluted or fancy containers at moderate cost. It is compact, sturdy, easy to operate.

THE TWIN-TURRET Labeler is available for those requiring higher production.

THE WORLD SEMI-AUTOMATIC LABELER, MODEL S handles any size container from tiny samples to gallon jugs and any size and shape labels — body — body and neck — body, neck and foil — and all around the body of the container.

The WORLD'S best Labeler for you is backed by the unsurpassed engineering, production and service resources of an organization specializing in Labelers exclusively. WORLD LABELER HEADQUARTERS is at all times ready to assist you on problems of label application, labeler selection, labeler installation and operation.

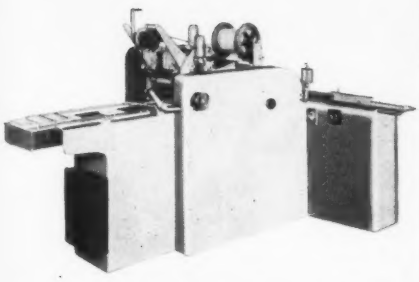
"YOU GET THE BEST LABELERS IN THE WORLD"

ECONOMIC MACHINERY COMPANY

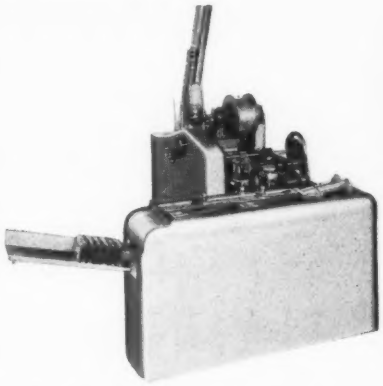
Builders of World Automatic and Semi-Automatic Labelers for Every Purpose

WORCESTER, MASSACHUSETTS

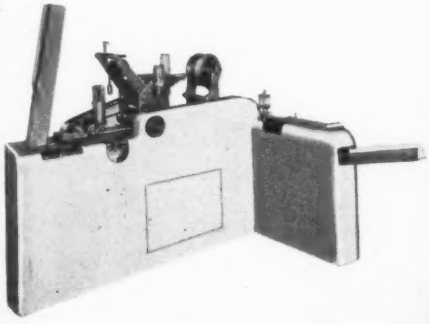
New York Philadelphia Pittsburgh Chicago San Francisco Denver
Louisville Salt Lake City El Paso Seattle Portland Phoenix London
Montreal Toronto Winnipeg Spokane Vancouver Mexico City
Sydney, Australia Wellington, N. Z. San Juan, P. R. Ciudad, Trujillo, D. R.



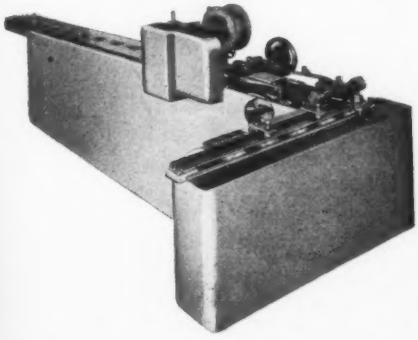
Scandia Fully Automatic Cello-wrapping machine equipped with electric eye for registering printed wraps, and tear-tape attachment.



Scandia Fully Automatic Cello-wrapping unit for general merchandise. Widely used by Tobacco Manufacturers, speed, up to 250 per minute.



Scandia Special Fully Automatic Cello-wrapping machine equipped for applying Revenue or Union Stamps and Tear-Tape.



Scandia Fully Automatic Cello-wrapping machine with long conveyor; Speed, up to 250 per minute.

perfect—trouble-free

Cello-wrapping

on Scandia units

up to 250 per min.

Standard Units for Standard Packs with or without Special Attachments

FOR SEALING MOISTURE IN, or keeping moisture *out*, speed, and smooth, quiet mechanical operation that does a perfect job—day in and day out—for years of economical production, SCANDIA provides features that appeal to hard-headed, volume producers. That's because Scandia units are *designed* for straightaway, rythmic performance, easy to feed, easy to adjust.

but fast!!

for CANDY—CIGARS—CIGARETTES—TOBACCO RAZOR BLADES—PHARMACEUTICALS, etc., and for Baked Goods, Soap, Dried Fruits in Tray Packs

Watch a **Scandia** *work—and you'll want* SCANDIA *performance!*

Built especially for high speed production, Scandia's can be supplied with certain time-saving attachments, as illustrated in photos.

Write for Catalog!

Scandia MANUFACTURING CO.

NORTH ARLINGTON NEW JERSEY

XUM

COMPLETE PACKAGING SERVICE

with Battle Creek Machines

Illustrated below are seven basic steps demonstrating the complete coördinated packaging service performed by Battle Creek Packaging Machines. There are separate machines for each individual operation illustrated; or complete coördinated units to perform all seven operations in the sequence shown. The completeness of the Battle Creek line, made up of machines designed to operate together smoothly and efficiently as a team, assures trouble-free performance of each operation, from start to finish.



1. Carton Feeder

Automatically feeds out carton blank, applies glue to side seam and bottom flaps, forms and seals carton around continuously moving mandrel at speeds of 75 to 90 per minute.



2. Bottom Sealer

Automatically applies glue, folds flaps and seals bottom of carton under 3 tons pressure for sift proof seals. Three models — 30, 60, and 90 per minute.



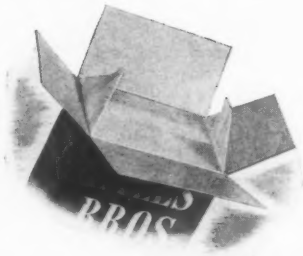
3. Liner

A built-in liner attachment is available on the carton feeder and bottom sealer to form and seal bags within the carton from glassine, waxed paper or cellophane. Speeds up to 90 per minute.



4. Filling

Three models are available (volume fillers, net weight or gross weight scales) to fill dry products in cartons at speeds up to 90 per minute.



5. Triple Roll Closure

The patented Triple Roll Closure machine creates an airtight package within the carton, all at speeds up to 90 per minute. Ideal for hygroscopic products.



6. Top Sealing

Continuous motion machines to create tightly sealed packages are available in three models — 30, 60 and 90 per minute—all furnished with pressure dryers for maximum sealing results.



7. Wrapping

Many models available to wrap packages ranging from a cough drop size to a 2 pound cracker size. Speeds range from 30 to 120 per minute, and any self-sealing material may be handled.

BATTLE CREEK BREAD WRAPPING MACHINE COMPANY, Battle Creek, Michigan

Announcing

CONSOLIDATED

POSTWAR POLICY!

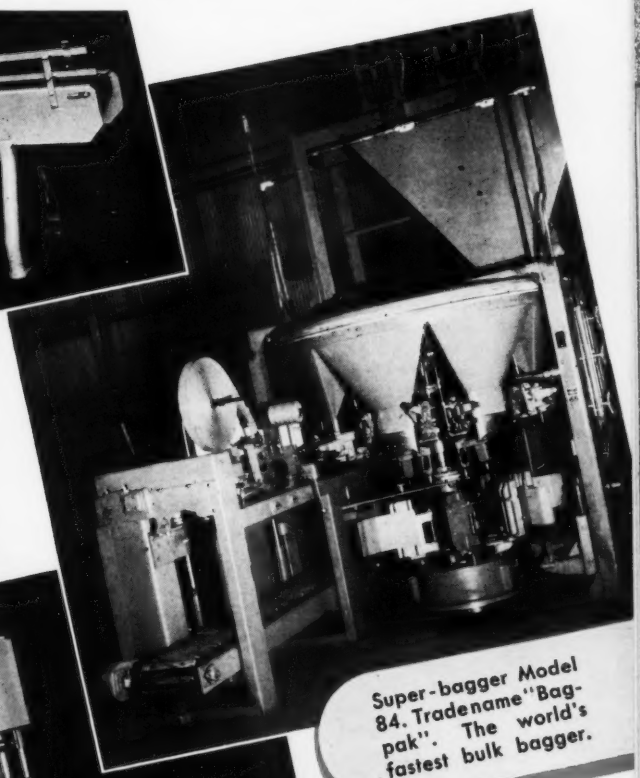
Our present planning gives effect to a new Consolidated policy—that of offering fewer types of equipment—but with the definite objective of making each type the unchallenged best in the field. By so concentrating our experience and facilities we are confident that when you specify CONSOLIDATED, CAPEM, HOEPNER, SEALTITE or BAGPAK you will be purchasing the absolute best by every important standard of comparison.



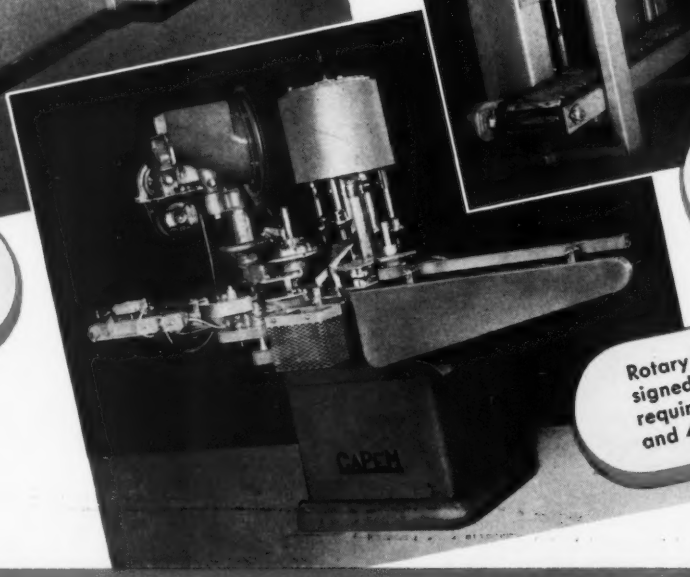
"Hoepner" Multiple Head Weighing Unit with settling device and package control.



ealtite "Synchromatic" 1946 utomatic Bag Feeder, Scales, ettler, Sealer and Drier for lb. to 10 lb. paper bags.



Super-bagger Model 84. Tradename "Bagpak". The world's fastest bulk bagger.

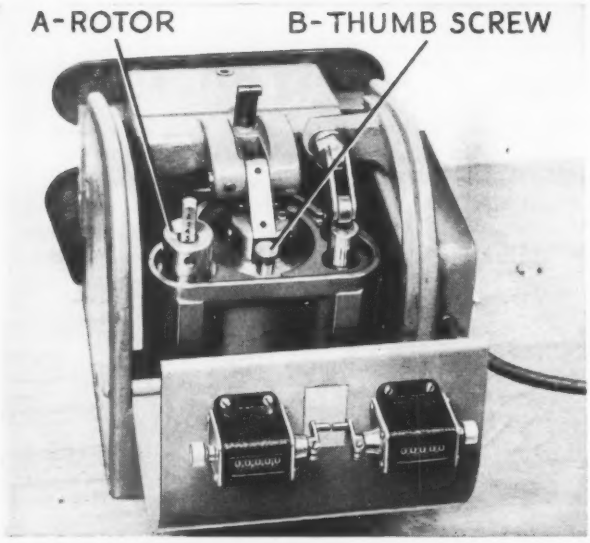


Rotary Type C-4-F CaPeM. Redesigned to meet every production requirement. Offered in 1, 2, 3 and 4-head types.

CONSOLIDATED PACKAGING MACHINERY CORP.

BUFFALO, N. Y.

HYDRAULIC CRIMPER MODEL A



AN ENTIRELY NEW PRINCIPLE IN THE HEAT SEALING OF THERMOPLASTIC MATERIAL

This new type of sealer is scientifically designed to seal all types of thermoplastic materials; particularly laminated paper, foil, Cellophane, Vinals, Rubber Derivatives, Saran, and the like. If material is thermoplastic this Crimper will seal it. Adjustment is made according to the specifications of the material supplier, with that combination of heat, dwell, and pressure best suited to the particular requirements of each material.

SIMPLICITY OF ADJUSTMENT

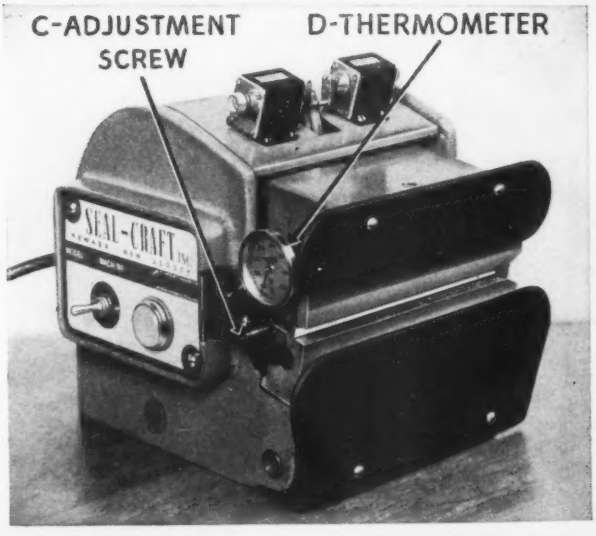
Model A is foot operated. No motor power is required and a slight pressure on the pedal develops up to 600 pounds on the crimp jaws, through the application of hydraulic principles. Control adjustments are so simple that no detailed instructions are needed. By turning Rotor "A", the pressure on the crimp jaws can be increased from nothing to 600 pounds (far in excess of pressure available in the average sealing machine). By turning thumb screw "B" the dwell (length of time during which the crimp jaws remain together under the full regulated pressure) can gradually be increased from a fraction of a second to a half a minute. By turning adjustment screw "C", the temperature of both crimp jaws can be regulated from 100° F to 400° F—the maintenance temperature can be observed on built in thermometer "D"

OTHER UNUSUAL FEATURES

The crimp jaws are rigidly fastened to the base and oscillating arm respectively with no intervening springs. As they do not "float," this insures continuous alignment of serrated crimp jaws or uniform contact of flat crimp jaws. The oscillating casting moves in an arc instead of vertically, so that the pressure on the crimp jaws is released from front to back. This eliminates the suction-pull of floating crimp jaws and eliminates the tendency to pull apart the sealed sections of laminated materials.

MAINTENANCE

As no motor is required and it is equipped with oilless bearings, and the crimp jaws are maintained at fixed rigid alignment, there is nothing to wear out and the maintenance cost is negligible. A machine of this model, running sixteen hours a day, for over a year, showed no evidence of wear or service required. We shall be glad to send you our new bulletin which describes in detail the new Hydraulic Crimper Model A.



SEAL-CRAFT
INCORPORATED

215 CENTRAL AVE.
NEWARK 4, N. J.

CREATED BY ENGINEERS WITH TWENTY-FIVE YEARS EXPERIENCE IN SEALING, CRIMPING AND PACKAGING

LAMSON CORPORATION

1003 Lamson St., Syracuse 1, N. Y.

Manufacturers of Conveyor Systems and Pneumatic Dispatch Tubes

Boston
New York City
Cheshire, Conn.
Philadelphia

Pittsburgh
Baltimore
Washington
Atlanta

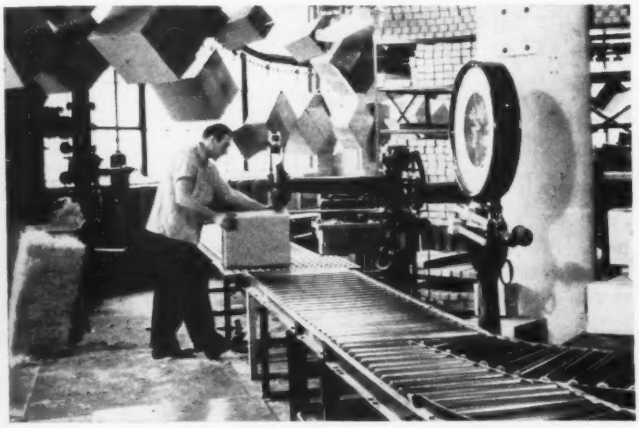
Cleveland
Detroit
Cincinnati
Chicago

St. Louis
Dallas
San Francisco
Los Angeles
Seattle

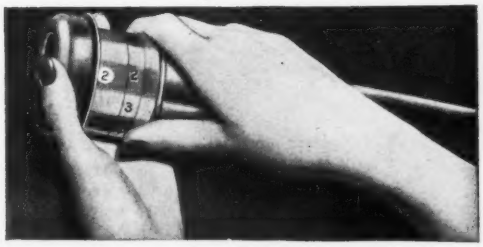
• Lamson Corporation specializes in conveyors for package handling, providing a wide range of equipment from the lightweight gravity conveyors which are easily set up wherever needed, to automatic conveyors which coordinate entire plants. In addition, we provide Pneumatic Dispatch Tubes used in manufacturing plants and offices to handle production orders, job tickets, stock requisitions, mail, telegrams—even small tools and laboratory samples.

COMPLETE ENGINEERING SERVICE

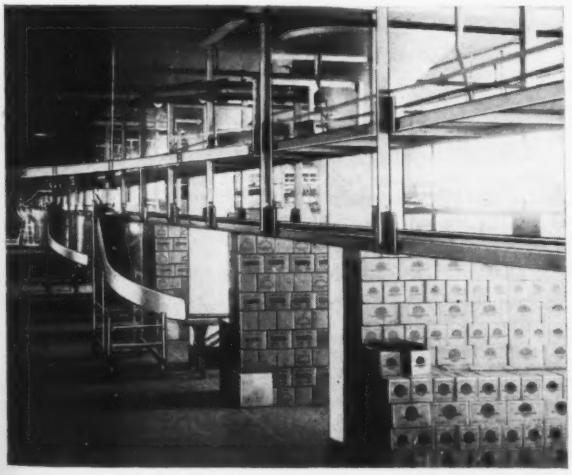
Our engineering department is thoroughly experienced in the correct application of conveyors and dispatch tubes to package handling problems. Factory trained resident engineers are always available for free consultations.



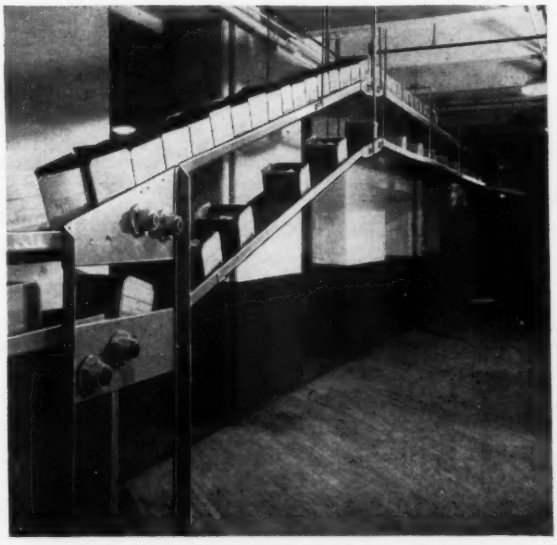
Packaging department in a midwestern plant. Note that empty cartons are brought to the packers by overhead conveyors whereas roller gravity conveyors take the packed cartons away.



A typical message type pneumatic tube carrier. The indicating rings set by the person sending the carrier show its destination.



Warehouse conveyors in a famous drug plant. Lower belt is used to bring cartons to stock piles. Upper belt conveys outgoing orders to shipping department.

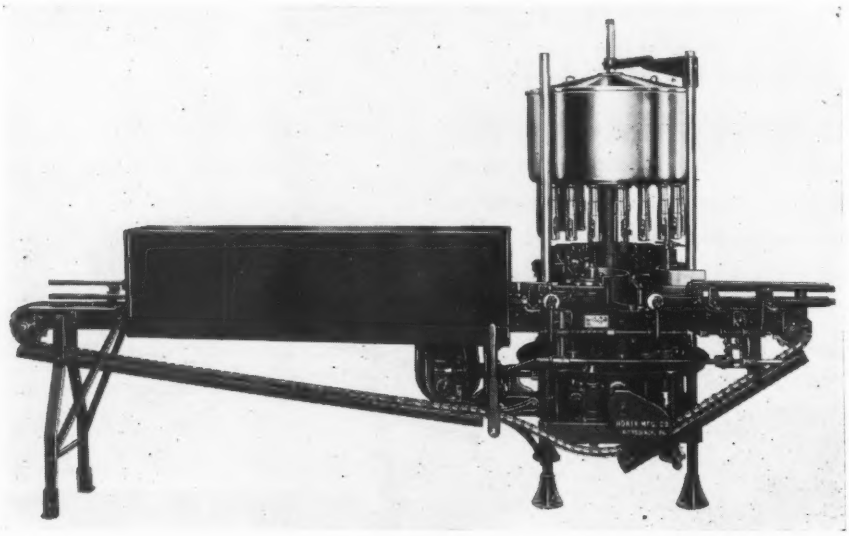


Two-way conveyor in a large Eastern biscuit plant. Empty cartons move to packing department on top belt whereas lower belt returns them to the sealing machines.

HORIX MANUFACTURING COMPANY

PITTSBURGH 4, PENNA.

FULLY AUTOMATIC ROTARY FILLERS



FOR FILLING STILL LIQUIDS INTO GLASS CONTAINERS

FOR years we have been building the finest fillers for still liquids obtainable. Today, because of new production and shop procedures, developed by us for the precision manufacture of War Material, we are building better equipment than ever before.

Shown above is a Horix 18-Valve Fully Automatic Rotary Filler, designed for filling vinegar, fruit juices, etc. This particular machine is equipped with a glass pre-heater on the infeed conveyor, a turret type infeed, sleeve type valves, with conveyor driven from the filler.

Every Horix Filler is individually constructed to meet the specific requirements of each particular job.

GENERAL SPECIFICATIONS

VALVES: 9 to 48 depending on desired production and size and shape of container. Made of 18–8 stainless steel. Design and construction governed by product. Built to provide uniform fill to any predetermined height. No drip. Will not operate without a container in place.

TANK: 18–8 Stainless Steel. Special Vent Cleanout Ring if required for heavier liquids.

FEED LINES, ETC.: 18–8 Stainless Steel.

MOTOR: Standard open or explosion-proof, depending upon nature of product.

CONVEYOR: Length as required. Flat top chain of malleable iron, steel or stainless steel as required. Equipped with anti-friction, self-aligning bearings. Can be driven by the filler or from any type capper.

PREHEATER: Installed on infeed conveyor if product is filled hot into glass containers.

FEED AND DISCHARGE PARTS: Worm type or turret infeed, push-off or turret discharge depending upon desired production speeds, type of containers and filling height. Parts can be provided to handle any shape container up to gallon capacity.

SAFETIES: Automatic, built-in to all rotary machines to prevent damage to containers or machine, product loss and costly tie-ups.

VACUUM SUPPLY: Installed if required. Standard pump and vacuum assembly or special double trap assembly depending upon nature of product.

ROTATION: Right or Left Hand as required.

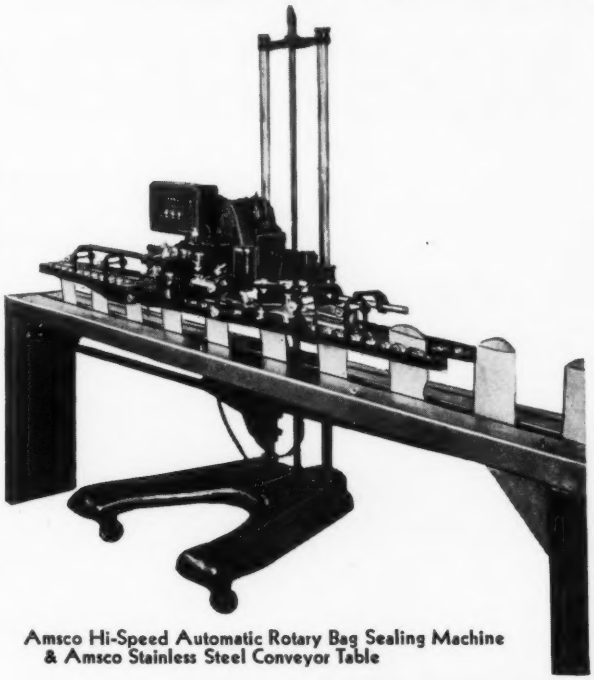
Write to us for complete information regarding a filler built to specifications dictated by your special requirements. Tell us what liquid you are filling, what size and type containers you are using, and desired production.

XUM

AMSCO FOR YOUR PACKAGING MACHINERY REQUIREMENTS

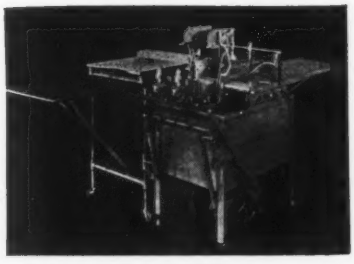
for greater efficiency speed and economy AMSCO offers machinery to perform the following operations:

1. Bag making
2. Bag & carton weighing & filling
3. Bag aligning & conveying
4. Bag sealing
5. Wrapping
6. Sheeting & gluing
7. Sandwich making & wrapping
8. Sealing by hand & foot operated devices — hot plates & sealers

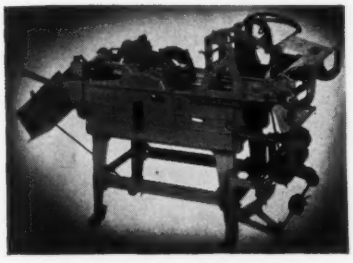


Amsco Hi-Speed Automatic Rotary Bag Sealing Machine & Amsco Stainless Steel Conveyor Table

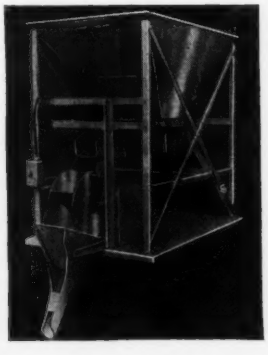
Literature available upon request



Miller Wrapping & Sealing Machine



Simplex Bag Making Machine



Holm Automatic Weighing & Filling Machine

AMSCO PACKAGING MACHINERY, INC.

31-31 Forty-Eighth Ave., Long Island City 1, N. Y. • STillwell 4-4840

Represented in Mid-West — Miller Wrapping & Sealing Machine Co., Chicago 6, Ill.

Represented on Pacific Coast — Simplex Wrapping Co., Oakland 6, Calif.

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NEW
STRAIGHT LINE
VACUUM FILLER

● The newest dripless liquid filler, simplest and sturdiest on the market, designed and built by M. R. M. Co., handles all types of *liquid* and *semi-liquid* preparations including shampoos, *lotions*, and other *foamy products*. Fills complete range of bottle shapes, heights and mouth diameters—capacities 1 oz. to 1 gal. Bottle changeover in 3 simple operations, takes only a few minutes. All key metals are brass-plated or stainless steel, filling hoses are made of rubber or plastic.



8 POINTS to COMPARE

1 High speed production—up to 100 bottles per minute.

2 8, 10, or 12 spout sizes each machine custom-built to do the job.

3 Single, fully automatic glass overflow.

4 Adjustable to all size bottles—1 oz. to 1 gal. in few min.

5 Special dripless spouts.

6 Self-aligning bushings prevent spout bar from buckling and insure smooth operation.

7 Each spout individually fed, overflow carried without use of manifolds.

8 Special attachment to fill sprinkler-top bottles.

Demonstrations gladly arranged. *Designed and manufactured by*

m r m *Company*

DESIGNERS and MANUFACTURERS of FILLERS · CAPPERS · CONVEYORS

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AUTOMATIC WEIGHING MACHINERY

Made by specialists who have made only weighing machinery for many years



515-B

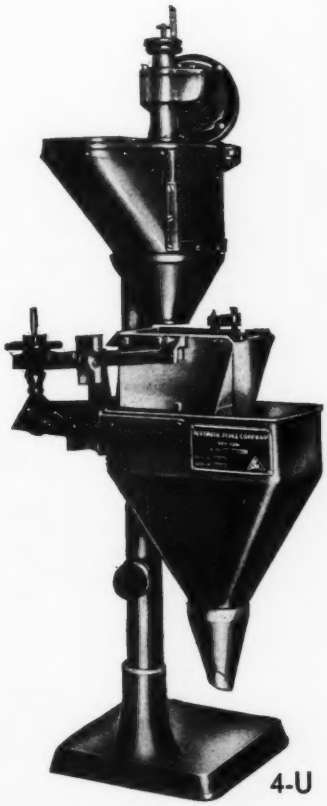
IT SACKS CHEMICALS, GRAIN, SUGAR, FERTILIZERS

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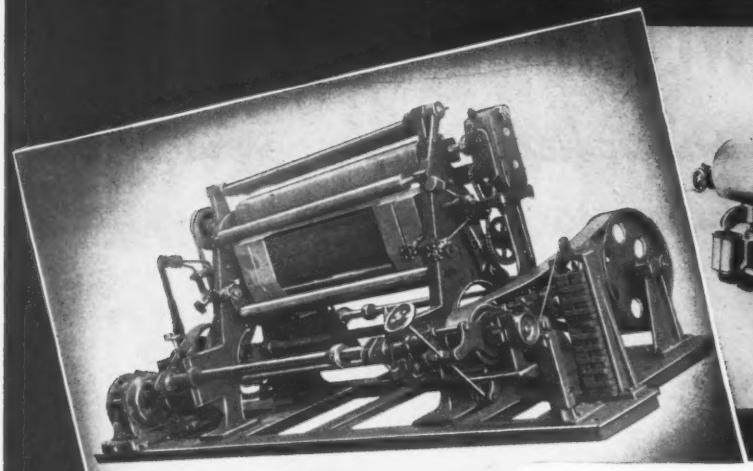
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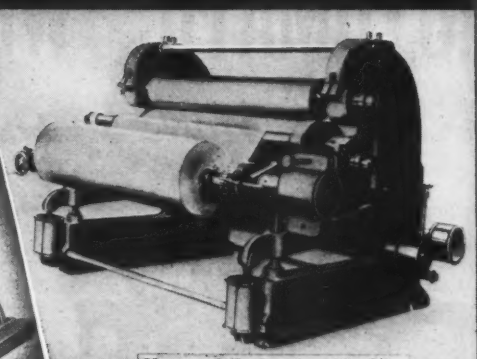


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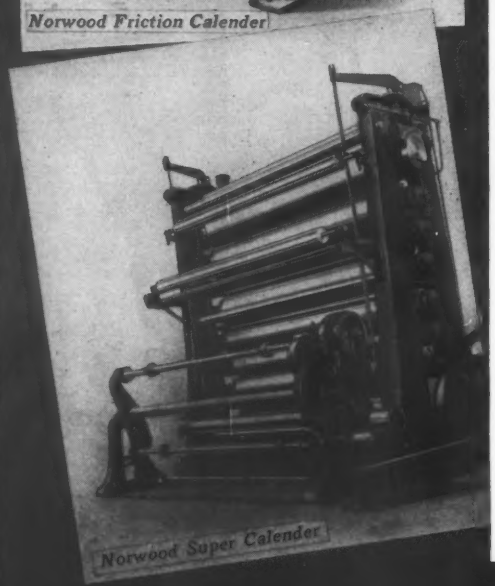
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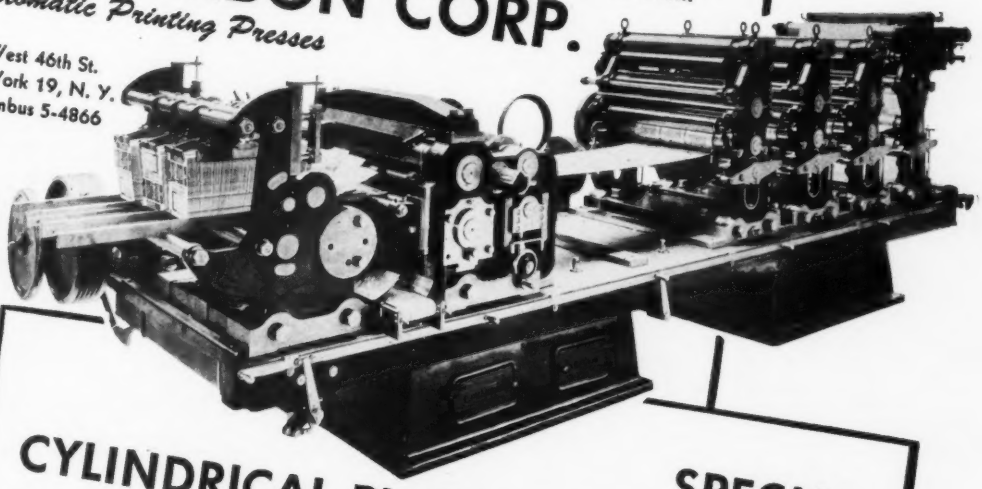
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XUM



PACKING FOR SHIPMENT

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XUM

Standard shipping practices

Although wartime conditions introduced certain important changes in the field of shipping, and although some of these changes, such as those affecting the packaging of metal parts (see p. 863) promise to be permanent, standard shipping practices have, in general, remained in force during the past six years. In the following pages, these practices are summarized and the reader is directed to sources where more detailed information may be obtained. Many of the subjects treated here are also discussed at greater length in other articles in this section.

Shipping agencies in the United States include rail (freight, express, baggage and parcel post), trucks, ships and airplanes. While airplane shipments of freight have been new and very small proportionately, there will doubtless be great progress in this field.

Today, however, the great bulk of merchandise travels by rail freight and the following considerations are, therefore, directed chiefly to this method, remembering that trucks and, to a lesser extent, other methods of transportation follow similar general principles. Our interest here is in freight and particularly in the methods of packaging merchandise for LCL freight since many C/L shipments are bulk while most LCL shipments are packaged.

To play any game properly, it is first necessary to know the rules. These rules on shipping methods are quite complicated in the aggregate, but become simpler when properly broken down. Although we can touch only the high points here, it is well to consider the most important ones, listed below:

Consolidated Freight Classification (Rules 5, 40, 41)
Motor Truck Classification (interstate and common carriers)
Official Express Classification (Rule 18)
U. S. Treasury Department Regulation No. 6 (bottled-in-bond spirits)
U. S. Government Federal Standards (there are several hundreds)

The Freight Loading and Container Section of the Association of American Railroads has jurisdiction over containers used for packing fresh vegetables and fruits, while the Bureau of Explosives of the Association of American Railroads issues rules for shipping dangerous articles by freight, express, baggage, motor vehicle and ship.

The Post Office Department does not issue detailed packing specifications, although they do maintain a "Classification Department" at the New York City General Post Office. Rules may be studied by consulting the Postal Regulations or specific pamphlets available at all post offices. In case of doubt, submit your proposed package to your local postmaster. Parcel post packages must not exceed 70 lb. in weight nor 100 in. in length and girth combined which is equivalent to the "height plus the waist measure."

There are no uniform specifications for transocean shipments.

There are no official airline specifications.

While Canadian regulations are not as voluminous nor as detailed as those in the United States, they follow the American specifications very closely. This is especially true for freight.

Freight regulations

The freight regulations are fairly complicated at first glance. Thus, it is first necessary to look up your product under the commodity rate tariff of your individual railroad association (for instance, the New England Freight Association). This is assuming that the shipment would move at commodity rates. However, if it moves under exceptions to the classifications, it is necessary to refer to the *Exceptions to Classification* published by the associations. If it moves under the classification ratings, it is then necessary to refer to the *Consolidated Freight Classification*. In other words, commodity rates take precedence over the exceptions and the exceptions, in turn, take precedence over the classification. The above is necessarily a very brief description of a most complicated traffic subject.

Actually, the *Consolidated Freight Classification* is the reference most widely used since this large volume lists each commodity giving in most instances the form of container to be used. These containers in turn are described in detail in Rules 40 and 41 and also under the special container descriptions printed elsewhere in the classification book.

The *Consolidated Freight Classification* may be consulted at 143 Liberty St., New York, or it may be secured by subscription from the Consolidated Classification Committee, Union Station, Chicago. The subscription rate is $2.50 per annum and includes all supplements. Check should accompany order.

Packing perishables

Full jurisdiction over all containers used for packing fresh fruits and vegetables, and over the methods of loading these containers in freight cars, is given to the Freight Loading and Container Section, formerly the Freight Container Bureau of the Association of American Railroads. In August, 1945, the name of this organization was changed from Freight Container Bureau to Freight Loading and Container Section, and headquarters were moved from New York City to 59 East Van Buren St., Chicago Ill.

Test shipments

The carriers recognize that constant experimentation is the road to improved containers and reduced damage claims. For that reason, they are very lenient and cooperative in regard to legitimate test shipments of new containers. Sometimes these can be arranged for by conferring with the carrier involved. The Freight Loading and Container Section and the Freight Classification Committee have definite procedures for carrying out such test shipments. In respect to freight, this procedure is described in detail in Rule 49, added to the *Consolidated Freight Classification*.

Express shipments

Shipments in fibre boxes sent by express must comply with the regulations of the *Official Express Classification* and particularly with Rule 18 of that classification. This pamphlet may be secured by application to the Railway Express Agency, Inc., 230 Park Ave., New York. The subscription is free upon application, and supplements are issued from time to time although only two supplements are in effect at any one time. Changes are less frequent than in the *Consolidated Freight Classification*, and are often arranged informally without regular docket hearings. Rule 18 follows the freight Rule 41 very closely but in a more abbreviated form. The principal differences are that on packages weighing 35 lb. or less, a nonconforming box will be accepted unless such package exceeds 50 united in., in which case they must also be crated or "securely wrapped" for acceptance. There are certain exceptions to this rule and these are listed in the *Consolidated Freight Classification*.

The other important difference is the fact that all regular express boxes will be accepted up to 90 united in. and the gross weights vary with the strength of the board. Some merchandise will not be accepted by express in fibre containers. This includes mirrors (valued over $2.00), statuary and other miscellaneous items.

Bureau of explosives

The shipment of all dangerous articles comes under the control of the Bureau of Explosives, 30 Vesey Street, New York, and their published regulations take precedence over the standard freight, express and other requirements. These regulations apply on all methods of transportation and a copy may be secured on application. The transportation of explosives and dangerous articles is covered by an act of Congress which authorizes the Interstate Commerce Commission to utilize the services of the Bureau of Explosives in carrying out and enforcing the provisions.

The Bureau of Explosives regulations cover inflammable materials, explosives, fireworks, poisons and other dangerous articles. In many cases, special requirements must be complied with when packing this type of merchandise, such as the use of labels and special marking. Because of the dangerous nature of this merchandise, the Bureau has to impose stricter requirements than in the case of ordinary freight and has to be very efficient in policing and enforcing them.

Motor trucks

This form of transportation has now become so popular that several classification books are available. The principal one is the *National Motor Freight Classification*, published at 1013 Sixteenth St., Washington, D. C. This also lists the various commodities and states how they should be packed, but does not require that these containers conform to any detailed specification. A movement is now under way to bring these containers in line with present freight specifications.

Fibre containers

Inasmuch as fibre containers are still relatively new in comparison with wooden boxes, it is necessary to comply with certain legal regulations when using these containers for shipment. The principal regulations are:

Rail freight—The regulations for freight shipment of merchandise in fibre containers are promulgated by the *Consolidated Freight Classification* representing about 950 participating railroads and coastwise steamship lines. The services of an expert traffic man are required to decide whether a given product comes under the commodity rate tariff of an individual railroad association, under exceptions to the *Classification* or under the *Classification* ratings themselves. In the latter event, the requirements are uniform for all carriers and the detailed specifications covering the use of fibre containers are contained in Rules 5 and 41 of the *Consolidated Freight Classification*. Every shipping man should subscribe to this service as the book not only contains all rules and regulations covering freight shipments and packing specifications for articles in fibre containers, but also lists the individual commodities together with prescribed methods of packing each.

Rule 5 states that "all containers must be such as to afford reasonable and proper protection to contents" and also defines such words as "packages," "bales," "bundles," "boxes," etc. Rule 41 defines "boxes" of various accepted styles and describes how they should be manufactured, sealed, tested and otherwise made ready for shipment. Inasmuch as each of these words has a very definite meaning, the definitions are shown below.

When the item is specified "in boxes," it means that when corrugated and solid fibre boxes are used, they must conform in all respects to the specifications in Rule 41. This includes many patented or infrequently used boxes.

The only other definition of "boxes" is found in the furniture classification where a box may measure up to 85 united in. on 200 test, and 100 united in. on 275 test.

The words "bales" or "bundles" mean, in reference

to corrugated or solid fibre boxes, that the weight and dimension limits may be disregarded provided that when oversize or overweight, they are "securely bound" with metal straps, wire or ropes. Sometimes bales or bundles are charged a premium of 20 per cent over the "in boxes" freight rate. The details of this ruling are too lengthy to repeat here but any shipper planning to use bales or bundles should first carefully read and understand Section 3-D of Rule 5 to make sure of using the package which shows the lowest net cost and freight rates as balanced against the cost for shipping an oversize or overweight box.

The term "in packages" is almost as lenient as the term "loose" and means in effect that no packaging requirements are imposed provided the carrier considered the package to be "reasonable and proper protection" under the wording of Rule 5, Section 1. Applied specifically to fibre containers, the term "in packages" means that a box or wrapper may be used without regard to style, test, size, weight or sealing.

"Wrapped" is a term usually applied to furniture shipments and means that all finished surfaces and upholstered parts must be protected and wrapped in a choice of indicated materials, one of which is usually fibreboard. No restrictions are imposed regarding the style of the box, its strength or sealing methods. Often creased sheets are used secured with metal straps.

Occasionally one encounters the terms "in cartons—see note" and this usually refers to a specific exception which differs from Rule 41. There are many hundreds of such exceptions so that it is always desirable to look up the exact type of packing which regulations require for any new items you ship.

All fibre containers conforming to the Rule 41 definition of "boxes" must carry a circular boxmaker's certificate. If oversize or other containers not conforming to Rule 41 are permitted, a rectangular certificate is required with the name of the item included, such as "Box for Brooms." Packages containing fragile articles or articles in glass or earthenware must be marked "Fragile—Handle With Care" or bear similar precautionary marks (Rule 6, Section 2).

When used for LCL shipments, boxes must either show description of contents or an identifying symbol or number which must be explained on the shipping order and bill of lading (Section 7-B). The bill of lading must also be endorsed: "The fibre boxes used for this shipment conform to the specifications set forth in the boxmaker's certificate thereon and all other requirements of Rule 41 of the *Consolidated Freight Classification*" (Section 7-C). Many new users of fibre containers have been puzzled by 20 per cent penalties assessed on the freight charges due to failure to endorse the bill of lading in this manner.

Dangerous articles—In the present connection, the expression "Dangerous Articles" includes explosives, fireworks, ammunition, inflammable materials, corrosive liquids and poisonous substances. The regulations covering the shipment in fibre containers of dangerous articles are promulgated by and published by the Interstate Commerce Commission through the Bureau of Explosives and take precedence over all other freight regulations including every form of transportation. Naturally, these regulations are more severe than for ordinary freight and are more rigorously enforced. Reference to the Bureau of Explosives regulations will also be found in Rule 35 of the *Consolidated Freight Classification.*

In 1941, the Bureau of Explosives was greatly simplified so that most regulations applying to fibre containers appear in specification ICC-12B. Other minor specifications are still retained such as 12C and 12E referring to patented and seldom used containers.

The Bureau is very strict in regard to its requirements for labels and markings. Certain boxes must carry a distinctive colored paper label. For instance, a red label is used for inflammable liquids and a yellow label for matches. These labels may be purchased from the Bureau or may be printed in the correct color on the container by the boxmaker. In other cases where no label is required the box must be printed, "No label required." This is especially true of freight shipments as most express shipments must carry labels. In addition nearly every item requires certain type matter on the box such as "Handle carefully," "Keep fire away," "This side up" and most often the name of the contents. The bill of lading and shipping order must also be endorsed with certain statements such as reference to label requirements. Cars also in some cases must be placarded. Such details are important.

In 1935, the Interstate Commerce Commission extended its jurisdiction over the shipments of dangerous articles on interstate common carrier motor trucks, which means that all the regulations applying on this merchandise when moved by rail freight must also be complied with for truck shipments. These truck regulations are also published by the Bureau of Explosives. This is not the case for nondangerous articles.

At about the same time the Bureau also issued regulations covering the transportation of this merchandise on freight and freight-and-passenger vessels.

Motor truck—Today there are no motor truck regulations covering the strength and construction of fibreboard boxes and theoretically any under-test container can be used, in which case the truck would have a decided advantage over the railroad. Discussions are now under way with the object of developing uniform strength regulations for both trucks and rail freight.

Parcel post—The Post Office Department has not issued any blanket order containing specifications for fibre containers. Scattered through their other publications, however, will be found items where corrugated boxes are specifically recommended. These include valuable or breakable merchandise such as cigars, cut flowers, liquids in glass and the like. The parcel post regulations recommend the use of strong wrapping for outer packaging and since the post office looks on fibre containers as excellent answers to this requirement, a great many corrugated boxes are in daily use for parcel post shipments. In addition to offering protection,

these boxes are easy to seal efficiently, are light in weight and make a good appearance. Such packages may not exceed 100 in. in length and girth combined. In measuring a parcel the greatest distance in a straight line between the ends is taken as the length, and the distance around the parcel at its thickest part is taken as the girth. Shipments of liquids in glass are accepted up to certain definite limits but this does not apply to liquor. The limits are much lower on inflammable liquids.

In general, the parcel post requirements are difficult to interpret and apply to new or unusual packages and in such cases the safest procedure is to submit such a package in its final form to the local postmaster before instituting shipments.

Wooden containers

Crates—The simplest form of wooden container is the ordinary crate. Actually, the modern crate is not at all simple since an enormous amount of engineering study has been devoted to its structure in order to combine the maximum of strength with the minimum of expense. Much of this research was carried out by the Forest Products Laboratory at Madison, Wis., augmented by the engineering staffs of the larger producers of lumber and wooden containers. The Forest Products Laboratory has published its findings in a series of bulletins and all crate users should own and study these publications. Not only are the best designs illustrated, but valuable information is also given regarding the proper kind and use of nails for each size and style. This is of paramount importance inasmuch as the method of nailing often means the difference between a good crate and a bad crate. The general *Consolidated Freight Classification* specification (Rule 40, Section 2) for crates is very brief, simply stating that they must be made of wood to protect contents on the sides, ends, top and bottom and so constructed that freight may be taken in or out of the car within the crate; that contents must be securely held within the crate, and that no part of the contents shall protrude. Surfaces which are apt to be damaged must be fully protected. A detailed description of crates for specific merchandise will be found under Paragraphs No. 530–568, inclusive, of the Package Descriptions, in the *Classification*.

Wood-framed containers—The wood-framed container can be considered as a crate with enclosed panels. These panels protect the contents from the weather, dust and outside contact. Originally these panels were made of plywood and many still are. Later, solid fibreboard and occasionally corrugated board were substituted for veneer in the interest of economy, lighter weight and to furnish a surface for display printing. Typical uses are for shipping console radios, cabinets, textiles and other large objects which are not excessively heavy.

The freight specifications for wood-framed containers, either corrugated or solid fibre panels, will be found in Section 3 of Rule 41 of the *Classification*, and specific styles are described under Packages No. 781, 785, 824, 839, 853, 874, 885, 888 and 915.

Wire-bound boxes—These are essentially wood-framed veneer boxes except that the patented construction permits them to be delivered KD as shooks and they have a lid which can be opened and reclosed. The ingenious use of attached wire reinforcement permits of considerable economies in cost and weight without sacrificing strength. Much of the income from royalty is plowed back into continuous research and sales promotion. Examples are the recent experiments in which fibre slats are combined with veneer slats and panels.

Wooden boxes—We now come to the old reliable standard wooden box. However, it also has received a lot of scientific study and has developed into many specialized forms for specific purposes. Thus, there are uncleated boxes, others with cleats either outside or inside and various forms of end framing. Some are tongue-and-grooved, others have lock corners, while special styles are built to order for many specific purposes. In all styles, however, nailing is of utmost importance. The nails must be the right size and kind and they must be driven properly. Here again the Forest Products Laboratory has contributed valuable scientific data which are available to anyone interested.

The railroads do not attempt a general description of wooden boxes except to say (Rule 40, Section 1-a) that they must have "solid or closely fitted sides, ends, tops and bottoms securely fastened" and that (Rule 5, Section 1-a) they must be "in such condition and so prepared for shipment as to render the transportation thereof reasonably safe and practicable." Incidentally, this last clause applies to *all* shipments tendered for freight regardless of the container used. Detailed descriptions of wooden boxes for specific merchandise are under Packages No. 179–274, of the *Consolidated Freight Classification*.

Miscellaneous containers

The *Consolidated Freight Classification* recognizes a number of other types of container, such as:

Baskets—These include baskets made of steel, wood, rattan, splint, bamboo, staves, veneer, willow and wicker. All of these and a few others will be found under Packages No. 146–169, inclusive.

Hampers—These are usually made of rattan or canvas, the latter sometimes being lined with wire netting. See Packages No. 602–606, inclusive.

Cabinets—Packages No. 430 to 433, inclusive.

Carriers—This form of container is used for shipping such items as empty glass bottles, bananas, oysters and foods refrigerated with either water ice or dry ice. These refrigerated carriers are insulated. Carriers are often mounted on wheels. Details are shown under Packages No. 460 to 473, inclusive.

Trunks—Trunks are often used for such items as salesmen's samples and are listed under Packages No. 714–718, inclusive.

Egg cases—Egg cases for freight are usually made in standard styles of wood although recently solid fibre and corrugated have been added. Detailed specifications will be found in Packages No. 511 and 512 while Package No. 893 describes the fibreboard case for shipment of small quantities.

Racks.....Packages No. 690 and 691
Reels.....Packages No. 695 and 696
Rolls.....Packages No. 700–708, inclusive
Tubes.....Packages No. 720 and 721
Trays.....Packages No. 789 and 875
Beams.....Package No. 790
Ballots.....Package No. 768
On Boards.....Package No. 769
Flasks.....Package No. 774

Shipments without containers

Any discussion of shipping methods must include the various methods of making "loose" shipments. Great strides have been made in recent years in the perfection of the various methods employed for shipping without containers.

The original and obvious loose shipment consists of large bulky items, such as machinery, automobiles and other merchandise either too large to go in a container or else of such a character as to render a container unnecessary. Inasmuch as many of these items are nonrecurring and have their shipping and bracing methods worked out individually, it is not possible to cover them in an article as short as the present one. Also it is not desirable to discuss here the shipment of such bulk commodities as coal, grain, etc., except to point out that even here new developments are constantly being adopted such as the carload shipment and handling of bulk cement, molten asphalt, fluid milk, acids and various chemicals.

Of chief interest to us, however, are the many novel methods being used as an intermediate stage between bulk and package merchandise. The modern scientific study of metal strapping and its uses has been one of the chief contributing influences. The proper use of metal strapping has developed within recent years a whole new technique in loading and bracing merchandise in freight cars. One development is referred to as "unit loading" wherein the contents of a freight car are divided into units which, in turn, are held together with metal bands or wires. No other bracing is used, and the "units" may shift in the car, thus reducing the dangerous effects of any severe impacts.

In another method, known as an "anchored" load, the load is stowed in the car in the usual manner and held back and braced by metal bands or wires which are fastened or anchored to the walls of the car at least 3 ft. back from the face of the load. The bands or wires extending from the anchors are brought around the front of the load, tensioned and then sealed. Sometimes when the nature of a load requires, a wooden gate is placed in front of the load and the bands sealed against it. As a result, greater economy and efficiency have been made in the C/L shipment of such merchandise as automobile frames and other chassis parts, rolls of paper, sewer pipe, drums, barrels, crates and similar items. Other modifications are "bulkbinding," "anchor strapping" and "Conbur bracing."

Complete technical information and assistance is readily available to all shippers on application to the manufacturers of metal strapping or to the various railroad and government agencies such as the Freight Container Bureau (Conbur), the various Shippers Advisory Services, the Transportation Division of the Association of American Railroads, the Mechanical Division of the A.A.R. and the Forest Products Laboratory at Madison, Wis.

The *Consolidated Freight Classification* also gives much detailed information on this subject under Packages No. 478–485, inclusive, and 625–655, inclusive. These include methods of bracing and protecting such loose items as pianos, canoes, bottles, building tiles, crucibles, sewer pipe (including the "double unit method") and others.

Bracing, skids and pallets

Great improvements have been made in methods of bracing, dunnage (see Rule 30 of the *Classification*), protection at car doors and proper storage in the car. Consult the Transportation Division of the A.A.R. for their voluminous illustrated data. A notable development in metal strap bracing has been the variety of skillful methods worked out for the boxing and securing of aircraft, important during the war years, for rail transportation on flat cars.

Shipping with skids and pallets is a method which lies between loose handling of materials and complete packaging. It probably started in the paper industry where several hundred pounds of sheets were loaded onto a plain wood skid, wrapped with waterproof paper and securely strapped to the skid for shipment to the printer. Other industries, notably the manufacturers of automobiles and electrical goods, were quick to realize the advantages and economies of this method of transportation and are now using it wherever possible for shipping such items as small motors, wheels, bumpers, clutches, mufflers, fire brick, etc. Additional advantages are the speed with which these skidded units can be handled in or out of the freight car and the convenience of storing.

Simple skids are also used in combination with fibreboard for the protection of heavy objects of a fragile nature such as furniture, refrigerators, ice cream cabinets, etc. Some of these are described in the *Consolidated Freight Classification* under Packages No. 678 (refrigerators), 710, 711, 712 (using insulated blankets), 752 (telephone booths), 754 (furniture) and also 824 (refrigerators).

Another modification is that of strapping several items together without a skid and without any outer container although it is sometimes desirable to have protection between the items.

Corrugated and solid fibre shipping containers

by Albert W. Luhrs

Since its beginnings about forty years ago, the corrugated and solid fibre box industry has had a phenomenal growth. In 1945, the industry produced more than five billion boxes, which was about three times the 1929 boom year production.

During its history, the industry has steadily expanded the uses for its products. Their low cost and light weight, combined with ample protection for their contents, have been the key to this remarkable growth, shown in the chart on p. 837.

Uses of fibreboard shipping containers

By the time of Pearl Harbor, most products shipped in packages weighing around 100 pounds or less were packed in corrugated and solid fibreboard shipping containers. Exceptions were some shipments destined for export and certain products such as fresh meat, fruits and vegetables which were to be stored or shipped under cold storage or moist conditions. Since the wartime developments, particularly those in connection with the V-box, are adapted to peacetime uses, it is possible that some of these perishable items will no longer be exceptions to the rule. Furthermore, heavier loads are now being carried in superstrength fibreboard boxes.

The fibreboard shipping container, made of corrugated and solid fibre, serves all American industry, as is shown by Table I. This is particularly borne out by the fact that, aside from food, few classes of products, by themselves, utilize very large percentages. It can be truly said that corrugated and solid fibre boxes move the bulk of the products of all of American industry.

Growth of the industry

The use of corrugated and solid fibre shipping containers is generally due to one or more factors, some of which are:

1—The corrugated shipping case proved its mettle when subjected to wartime beachhead handling. Shipping boxes may never again be so tested, but their demonstrated qualities will be useful in commercial shipping.

PHOTO, COURTESY U. S. COAST GUARD





PHOTO, COURTESY BIRD & SON, INC.

2—Cleated fibreboard type of construction provides lightweight, substantial container for textiles.



PHOTO, COURTESY GAYLORD CONTAINER CORP.

3—Corrugated box for bottled beer resulted from lumber shortage and need for a lighter container.



PHOTO, COURTESY YALE & TOWNE MFG. CO.

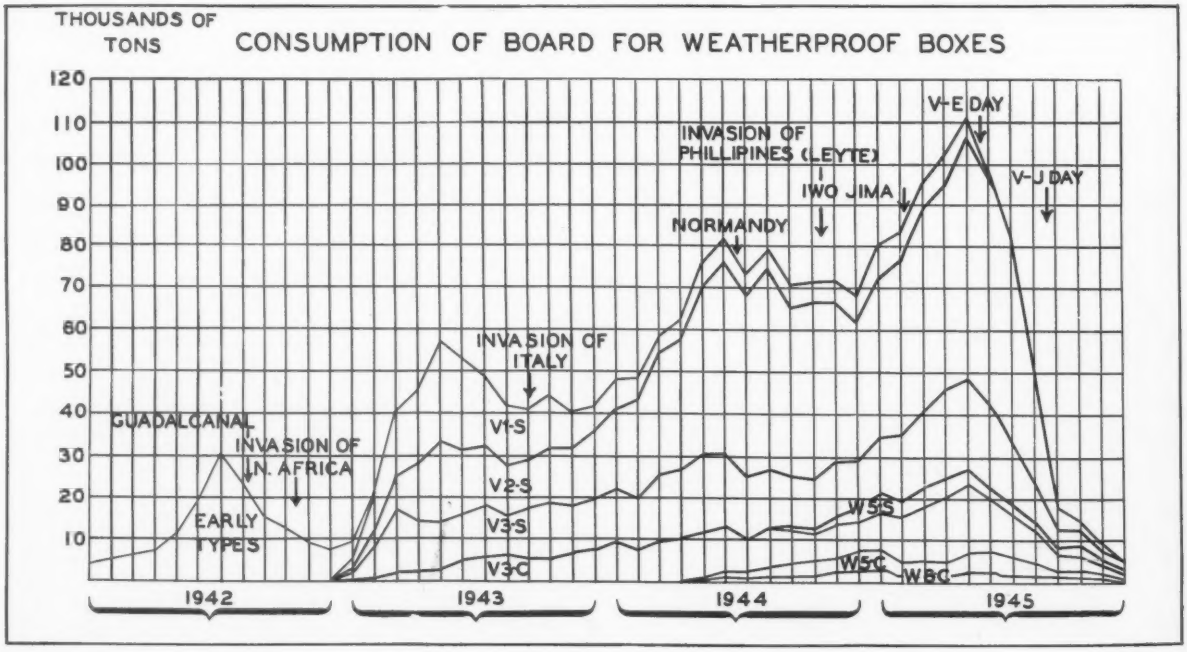
4—Here corrugated shipping containers in palletized loads are handled by mechanical equipment.

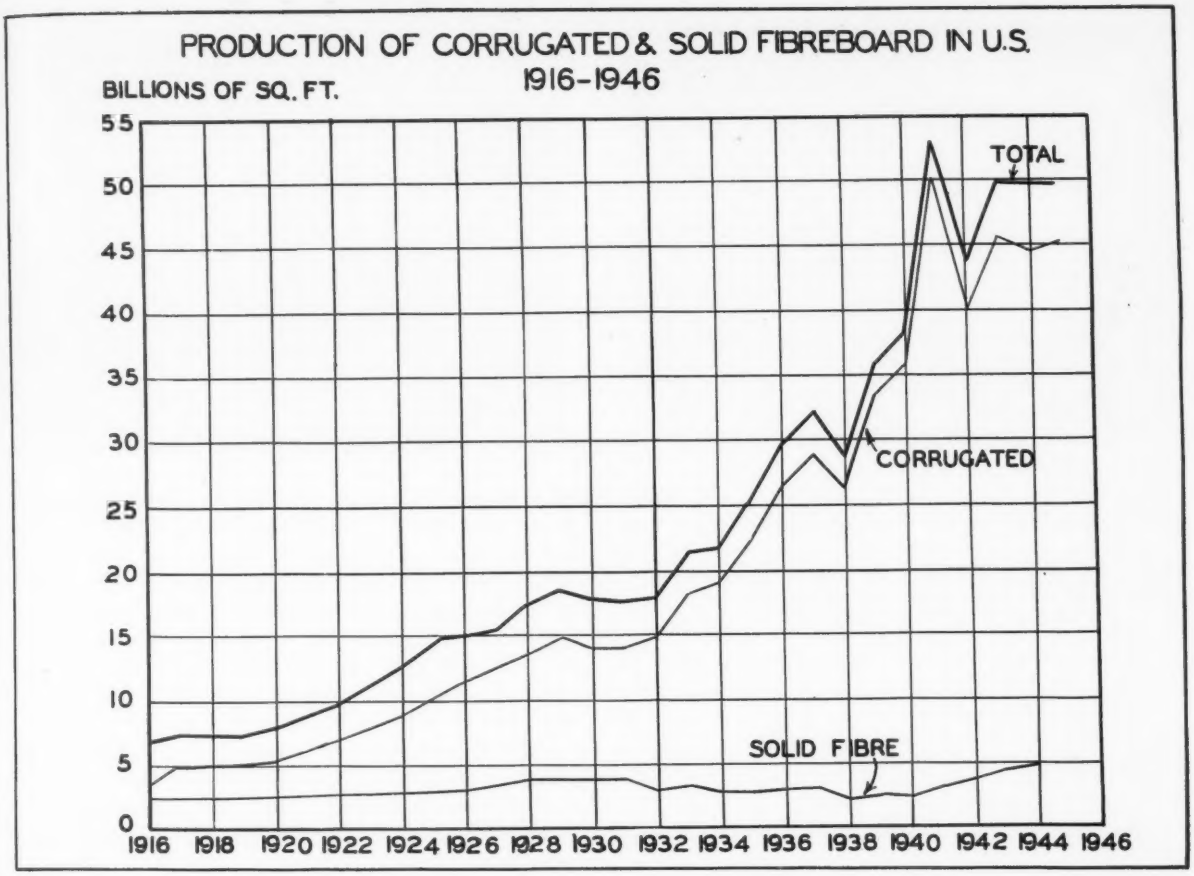
1. Light weight
2. Low cost
3. Ease in setting up and sealing
4. Small storage space required
5. Attractive printing
6. Can be handled automatically
7. Adaptable to interior packing
8. Cushioning properties
9. Wide source of supply

War experience—the V-boxes

World War II saw the development of fibreboard boxes with a high degree of weatherproofness, culminating in a V-box designed by the engineers of the fibreboard container industry, in cooperation with the armed forces, for shipments of all sorts of products all over the world. They met all of the adverse climatic

CHART COURTESY WEATHERPROOF BOX GROUPS





and handling conditions encountered during the period of the war.

Considered one of the important technical achievements of the war, the new boxes provided a degree of protection never before thought possible in a fibreboard container.

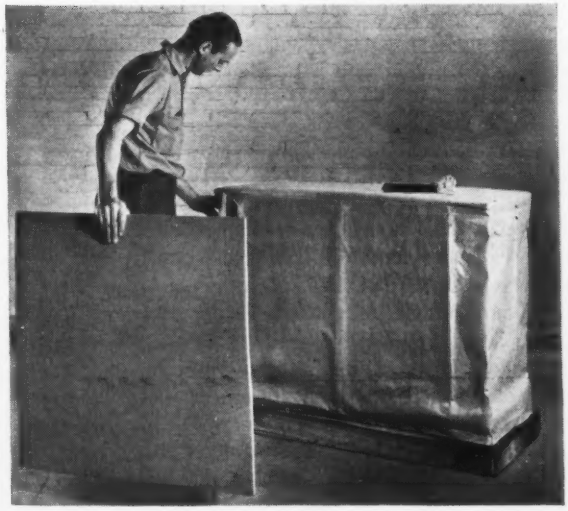
The extent of protection afforded by these new containers is borne out by the figures showing the comparative strength of the standard domestic containers and the newer V-boxes (Tables II and III, p. 841).

At its peak, the production of V-boxes represented more than 15 per cent of all the fibreboard boxes pro-

5—"Pressure packing." Furniture is wrapped in paper packs, then corrugated sheets are applied.

6—Corrugated cap fits over piece shown in Fig. 5, then entire assembly is strapped with steel bands.

PHOTOS 5 AND 6, COURTESY THE MENGEL CO.









PHOTOS 7 AND 8, COURTESY HINDE & DAUCH PAPER CO.

7—(Left) The exterior container carries the product identity. The interior construction has added display value. 8—(Right) By means of strategically placed scores, this shipper is transformed into a display.

TABLE I—USES OF CORRUGATED AND SOLID FIBRE BOXES BY PERCENTAGE OF TOTAL PRODUCTION

Description	*Corrugated % of total*	*Solid fibre % of total*
Agricultural implements and tools	0.5	...
Ammunition and component parts	3.0	1.3
Airplane parts and supplies	1.7	0.4
Automobiles, trucks, parts and supplies	3.4	0.7
Beverages (including boxes used for shipment of inner containers later used for beverages)	4.4	4.0
Tobacco and tobacco products	0.9	0.4
Sales direct to any department or branch of U. S. Government	3.4	8.8
Building materials, lumber, supplies and fixtures, hardware	3.8	1.0
Clothing	2.3	0.3
Boots and shoes	1.4	1.0
Drugs and pharmaceuticals	2.2	0.1
Cosmetics	0.4	0.1
Electrical products (industrial)	3.3	0.7
Confectionery	1.5	0.8
Food and food products (including boxes used for shipment of inner containers later used for food)	33.8	73.6
Household goods including such items as furniture, vacuum cleaners, refrigerators, and the like	6.8	0.2
Machines, tools, parts and accessories	2.3	0.4
Paints and varnishes	0.8	0.2
Chemicals	1.2	0.9
Paper and paper products	8.0	2.1
Matches	0.4	...
Petroleum products	1.0	...
Printing and publishing	1.7	0.1
Retail stores, jobbers and mail order establishments	2.0	0.2
Rubber products	1.4	0.6
Soaps and cleaners	2.5	1.2
Textiles, yarns, blankets, sheets, etc.	2.1	0.1
Products not used as shipping containers such as floor stands, cabinets, advertising novelties, etc.	0.3	...
Toys, bicycles and sporting goods	0.6	0.2
All others	2.9	0.6
TOTAL	100%	100%

duced, and consumed more than 32 per cent of the total materials used in the production of all fibreboard boxes. Being in large part a creation of the war, their use declined markedly after V-J Day. The chart on p. 836 contains full data about the consumption of materials for these containers.

The technical advances represented by the V-box will survive, however, and will be used in fibreboard containers manufactured for postwar shipments abroad, as well as for shipments of perishable products in the domestic market.

Box styles

The more commonly used styles of corrugated and solid fibreboard shipping containers are illustrated by the drawings in Figs. 9 to 13.

There are numerous variations of these styles. In addition, there are many other styles which are adapted to special purposes, such as the various furniture boxes, textile boxes, combination shipping-display boxes, die-cut folders, Bliss boxes, etc. About 90 per cent of all boxes used in the United States are made in the regular slotted style, while the balance is distributed more or less equally among a number of other box styles and variations.

Special types

During the past 15 years, many special types of fibreboard box have been developed. These are used in cases where the more common types are not satisfactory, and the list includes beverage boxes, cleated fibreboard boxes, egg crates, boxes for packaging frozen meats and many other containers.

Typical of these special boxes are the various returnable boxes used for bottled beer. Most of these have been made of water-resistant solid fibreboard, although some successful ones have been made of corrugated fibreboard. Some of the features of the beverage boxes have been incorporated into the nu-

merous widely used types of fibreboard box for shell eggs. It was basically from these returnable beverage boxes that the V-box was originally developed.

Another example is the cleated fibreboard box which closely resembles the cleated plywood box in all respects except that the panels are made of fibreboard (corrugated or solid fibre) instead of plywood. These boxes, with interior fittings of wood and fibreboard, are used for the packing of heavy items such as electric refrigerators, gas ranges, washing machines, etc. Boxes of this type are rapidly replacing other boxes for heavy shipments of textiles, clothing and similar bulky materials.

The boxes especially designed for furniture packing are radical departures from previously known styles. Some of these new boxes make use of wooden interior packing, fastened to the furniture, which serves to anchor the furniture within the box in such a fashion that adequate clearance is maintained over all finished surfaces. This method is adapted to many special needs, such as the suspension of items having relatively fragile legs.

Other special service boxes, such as those used for dynamite, shotgun shells and for many items of irregular shape, have been developed and are in fairly common use. In every case the style of box, method of closure, interior packing and other features have been designed especially to meet the necessary requirements. To develop such boxes and methods of packing, most of the larger box companies maintain package laboratories, or employ commercial container testing laboratories, which are constantly engaged in problems of shipping container design and research. (See *Testing Shipping Containers*, p. 859.)

Corrugated boxes in common use: 9—(Below, left) Cover depth of the full telescope box usually equals over-all outside height of body. The body slotting is at right angles to the cover slotting. 10—(Center) In the design of the full overlap box the outer flaps have a full overlap while the inner flaps are the same length as the outer flaps of the box. 11—(Right) In this box, the outer flaps have a full overlap while inner flaps meet in the center.

The experience of the armed forces with fibreboard boxes has shown that they can carry almost any product within reasonable limits of weight and size. All of the larger, and most of the smaller corrugated and solid fibre box manufacturers are equipped to produce boxes which will carry these and other products. The fibreboard box has become a custom industry, in that it can now produce a box to meet the requirements of practically any manufacturer.

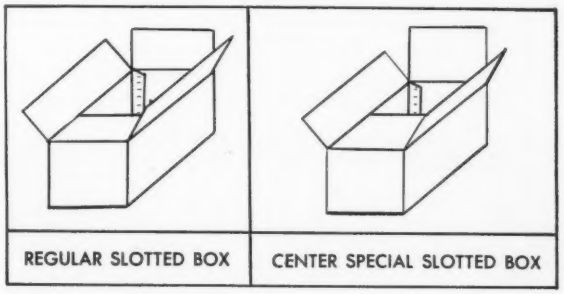
Domestic uses for fibreboard boxes

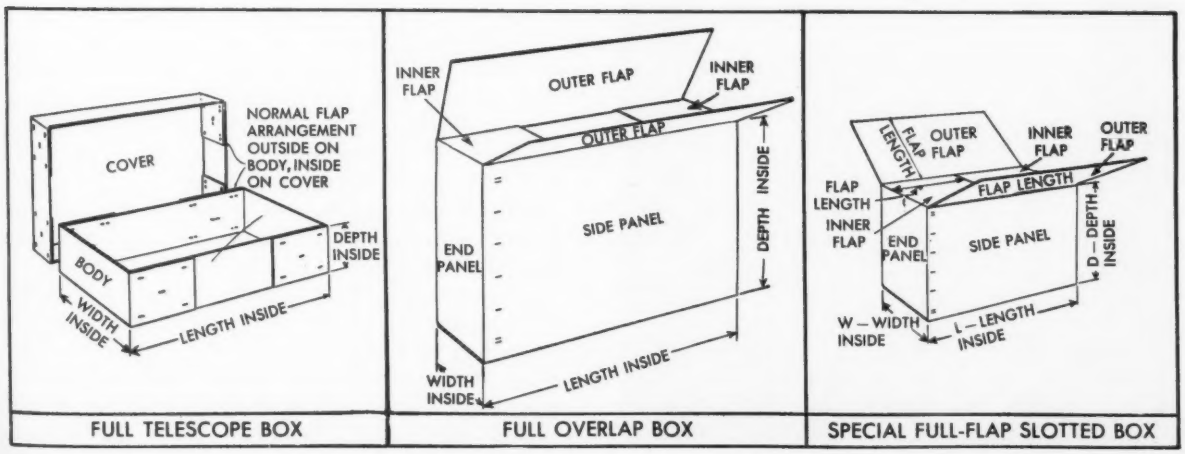
Prepacking—The term prepacking is generally applied to the method of packing merchandise in selling units at the point of manufacture, so that the product can be sold by the retailer from a store sample and deliveries made to the customer from the retailer's warehouse stock, without repacking. Great savings in time and labor, as well as added protection are afforded.

Practically all prepacking is done in fibreboard containers. The soundness of the principle assures that the present extent of prepacking will be maintained, and that it will be a matter of only a few years before almost all articles which lend themselves to such packing will be so handled. (See *Prepacking for Convenience*, p. 861.)

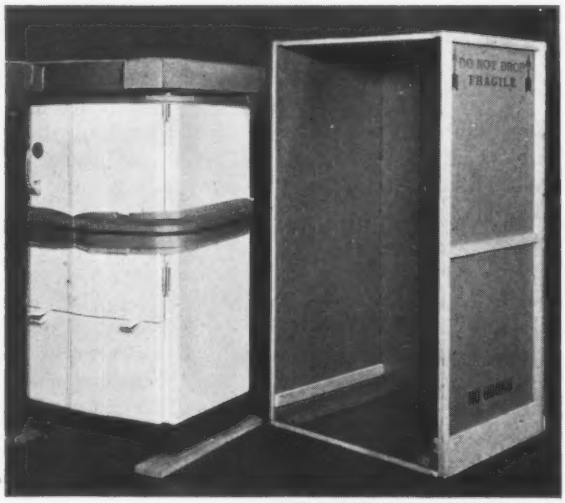
Air transport—The specifications of the armed forces state that the following factors must be considered in

12—(Left) In this case, the outer flaps meet. The inner flaps and outer flaps are of the same length. 13—(Right) Here the inner and outer flaps meet.

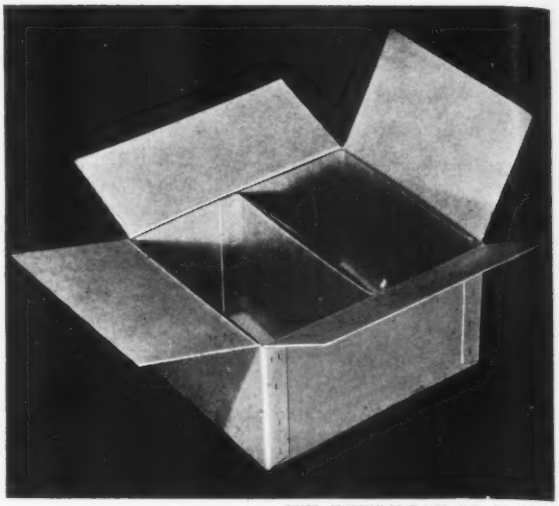




XUM



PHOTO, COURTESY ASHTABULA CORRUGATED BOX CO.



PHOTO, COURTESY CONTAINER CORP. OF AMERICA

14—(Left) Heavy household equipment, like refrigerators, is protected in transit by especially constructed cleated fibreboard containers. 15—(Right) This solid fibreboard shipper for dynamite helps to reduce shocks.

determining specifications for shipping containers for air shipment:

Lightness
Strength
Dimension limits
Weather resistance

They add further that "the fibreboard box, weather resistant and reinforced, if necessary, should be used whenever the weight and nature of contents permit."

Fibreboard shipping containers satisfy completely the requirements of lightness, strength, dimension limits and weather resistance.

16—Corrugated shipping containers may be used for palletized handling; these have been steel strapped.

PHOTO, COURTESY ACME STEEL CO.



Export shipments

The newly developed fibreboard containers are entirely adequate for export shipments. This will be attested to by any one in the armed forces who received a large part of his food and other supplies in such boxes. They underwent the most primitive of handling and storage conditions on their way to the front, and their record for general performance was most remarkable.

The industry has developed export containers of many grades which will, in peacetime, make it possible to use the lighter, cheaper and smaller fibreboard container for export shipments. At the time of this writing, export packing specifications are being developed which will serve substantially the same purpose as Rule 41 of the *Consolidated Freight Classification* does for domestic packing. Beyond question, boxes which were satisfactory for export under wartime conditions will be equally satisfactory in peacetime.

Palletized handling and unitized loading

Fibreboard boxes are particularly adaptable to the newly developed schemes for palletizing and unitizing. They can be produced economically in all sizes and types which are necessary for the efficient use of such practices. It is interesting to note that the U. S. Navy, which was largely responsible for the development of palletizing, has now standardized fibreboard boxes, in special sizes, in order to facilitate such handling of shipments.

Instead of using steel strapping, a method of gluing fibre shipping containers together on a pallet to make a nonshifting unit load has been developed. This involves the use of adhesives which have been specially designed to possess high shearing and low tensile strength properties. In addition to the use of such

TABLE II—RULE 41, CONSOLIDATED FREIGHT CLASSIFICATION FOR SOLID OR CORRUGATED FIBREBOARD CONTAINERS

Section 2—Fibre boxes without wooden frames must be made of 3-ply or more solid fibreboard, except as provided in Note 1, having proper bending qualities, all plies firmly glued together, and outer ply waterproofed; or of double-faced or double-wall corrugated fibreboard having proper bending qualities, each outer and each inner facing being of fibreboard having proper bending qualities, facings being firmly glued to the corrugated sheet and the outer facing waterproofed. The corrugating medium in all corrugated fibreboard referred to in this rule or in separate descriptions of articles must be made of board not less than 0.009 in. thick of quality sufficient to produce finished board of adequate rigidity.

If weight of any box and contents is less than maximum weights shown in this section, the maximum inside dimensions for that box may be increased the same percentage the actual weight is less than maximum weight specified.

Boxes conforming to Sec. 2 may have 2 hand holes and not exceeding 8 ventilation holes each not exceeding 2 sq. in. area. Boxes may also be perforated once around center to facilitate separation of box into 2 equal parts, provided such perforation does not materially affect strength of box.

The following requirements must also be complied with:

Maximum weight of box and contents (*Lb.*)	*Maximum inside dimensions, length, width and depth added* (*In.*)	*Minimum combined weight of component plies of solid fibreboard exclusive of adhesives* (*See Note 3*) (*Lb. per 1000 sq. ft.*)	*Minimum combined weight of facings of corrugated fibreboard, including center liner in double-wall boxes* (*See Notes 2 and 3*) (*Lb. per 1000 sq. ft.*)	*Minimum test per sq. in. of combined board, either solid or corrugated* (*Lb.*)
FIBRE BOXES				
20	40	114	52	125
40	60	149	75	175
65	75	190	84	200
90	90	237	138	275
120	100	283	180	350
DOUBLE-WALL CORRUGATED BOXES				
65	75	...	92	200
90	90	...	110	275
120	100	...	126	350
140	110	...	222	500
160	120	...	270	600

Note 1—Two-ply board may be used for solid fibre boxes, when maximum weight of box and contents does not exceed 40 lb., except that not less than 3-ply board may be used for hexagonal or octagonal style solid fibre boxes.

Note 2—When corrugated boxes testing not less than 175 lb., complying with this rule, are further reinforced with burlap covering securely cemented to outside of box with asphalt, maximum dimension limit may be 90 united inches and maximum weight limit 90 pounds.

Note 3—A maximum variation of 5% will be allowed in the specified weights per 1000 sq. ft.

adhesives in palletized loading, very satisfactory results have been obtained recently with fibre containers glued together in freight cars without the use of pallets. In this case, a conveyor is run right into the box car and, by means of a simple mechanical device, two strips of adhesive are applied to the bottom of the container just before it is lifted and loaded in the car. The result is that a large number of containers move as a unit, with resulting decrease in loss and damage. The adhesive is of such a nature as to permit the boxes to be broken loose at destination without too much muscular effort and without damage to the container.

TABLE III—REQUIREMENTS FOR V-BOARD AND W-BOARD

Type	*Grade*	*Compliance symbol*	*Corrugated fibreboard; nominal caliper of paperboard*[1]			*Solid fibreboard nominal caliper*[1]	*Minimum average bursting strength*		*Maximum weight of box and contents*		*Maximum sum of inside dimensions—type 1 and 2 loads*	*Maximum permissible ply separation (wet)*
			Outer liner	*Inner liner*	*Corrugated material*[2]		*Dry*	*After 24-hr. immersion*	*Type 1 load*	*Type 2 load*		
			In.	*In.*	*In.*	*In.*	*Lb.*	*Lb.*	*Lb.*	*Lb.*	*In.*	*In.*
							Exterior grades					
SF	1	V1s	...	...	...	0.100	750	500	70	70	70	1/4
SF	2	V2s	...	...	...	0.090	550	500	70	60	70	1/4
SF	3	V3s	...	...	...	0.090	400	150	70	40	70	1/4
CF	3	V3c	0.023	0.023	0.010	...						
SF	5	W5s	...	...	...	0.075	275	100	40	40	50	1/4
CF	5	W5c	0.016	0.016	0.010	...						
SF	6	W6s	...	...	...	0.060	175	50	20	20	30	1/4
CF	6	W6c	0.010	0.010	0.010	...						

[1] A 5% minus and unlimited plus tolerance is permitted in all calipers in table.

[2] Corrugations shall be "B" or "C" flute having approximately 50 or 42 flutes per foot, respectively.

Steel barrels and drums

by R. W. Lahey

All cylindrical metal containers of 10-gal. capacity and larger are classified as drums; both single-trip and returnable (multiple-trip) packages are included. Shortly after the end of the war, WPB removed all restrictions on the use of steel drums, a welcome relief, since the past four years had proved to be a trying period for steel container manufacturers, for those in the WPB, PAW and WFA who were concerned with control of steel drums, and for the users of these containers.

Steel, the basic war material, was never in sufficient supply to allow allocation of an adequate quantity for fabricating sufficient containers to meet the demand. Changes in the requirements of war material packed in steel drums, the shifting demands for these containers by the armed services, and the constant pressure of meeting convoy shipping dates with little warning, all contributed to the confusion. The shortage of drums became more acute as the war progressed, until the demand was so far in excess of the supply that curtailment of production of products packed in these containers was only averted by the end of the war.

Drum distribution was a problem child of the Containers Division throughout the years of restrictions. First the negative limitation order (L-197), then allocation, and finally the quota order, failed to provide a satisfactory distribution system. Proof of this was the large volume of appeals which were voiced as the result of order restrictions.

Great credit isdue to the steel container fabricators, as well as to the personnel in sections of the WPB charged with the responsibility for drum distribution. Their contribution to the war effort was accomplished under the handicap of a secondary rating in importance of steel usage. Only in rare instances did the war effort or our civilian economy suffer for the lack of steel drums.

The war brought few radical changes in the field of steel drums. They carried oil for the ships in our Navy, gasoline for the Air Corps and the Army, food for all branches of the armed forces, and chemicals for a multitude of uses. They even became makeshift shower baths for the GI, and at least one steel drum was essential to every well-equipped laundry in the South Pacific. Parachutes were packed in steel containers for safe shipment. Gyroscopes and precision instruments were packed in specially constructed steel containers to protect their delicate construction from damage in shipment and from adverse climatic conditions which might be encountered.

Experience with substitutes proved beyond question that the steel container was the most efficient and economical package for most liquid products. It was also clearly demonstrated that in most instances single-trip drums served better than returnable containers.

As a result of these wartime experiences, certain data have been obtained which have caused the Steel Shipping Container Institute, Inc., to engage in a program of cooperative general research and product development for the benefit of its membership and their customers. This research program includes extensive work on development of new and better drum linings as well as all phases of steel container construction. The work will be done in conjunction with the suppliers of raw materials and the customers of this industry.

Reconditioning

During the war, it became necessary for some shippers to recapture and re-use steel containers fabricated of steel lighter than 18 gauge.

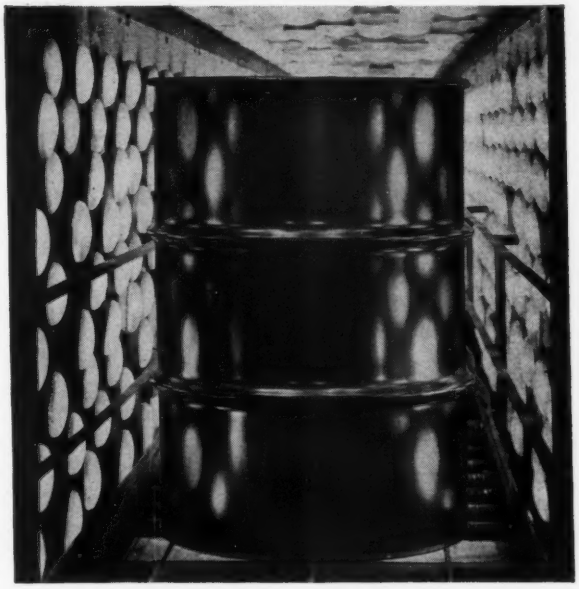
PHOTOS 1, 2, 3 AND 4, COURTESY RHEEM MANUFACTURING CO



1—Great care must be exercised in the manufacture of steel drums. Here a seam is flash welded after steel sheet is rolled into drum shape.



2—Galvanizing a drum by the hot dip process. The drum is here guided into a bath of hot coating.



3—After coatings are applied, the steel drum is conveyed through an oven lined with infrared lights.

This experience proved so unsuccessful that it is doubtful if it will be attempted again. Therefore, containers which are to be re-used should be made of 18-gauge or heavier steel.

Equipment for reconditioning should include provision for washing, air testing for leaks under water, drying, repairing and painting. Repairing includes welding of small holes, removing large dents and—in some instances—replacing leaky flanges. The choice of cleaning equipment is dependent on the number of drums to be cleaned and the degree of protection from contamination that the products which are to be transported require.

Reconditioners prefer to grade down drums rather than to spend extra time cleaning and repairing. If the drums are used for transporting dangerous articles, and permission has been obtained from the Bureau of Explosives for the re-use of ICC specification single-trip containers, they must be tested for leaks with air pressure, as required by the specifications, before they can be refilled and shipped again.

Returnable drums—16 gauge and heavier

These drums are, as the name implies, of rugged construction, built to withstand transportation abuses and fabricated for long life. They are manufactured in sizes of from 10- to 110-gal. capacity, and are specially constructed to meet the individual requirements of each product to be shipped in them. They are designed to provide for the safety and convenience of the men who must handle them.

The majority of these containers are fabricated from 12- to 16-gauge black steel sheets which, when required, may be sheet or "hot dipped" galvanized, tin dipped or terneplated. They may be lined with rubber, lead bonded or lined with light-gauge chrome-nickel-steel or aluminum sheets. Drums are also made of aluminum alloys, chrome-nickel-steel and nickel, depending upon the product to be transported in them.

These heavy returnable drums are made in both the full-open-head and tight-head types. The former are popular for packing dry materials or semiliquids. The covers of these drums are usually held in place by metal rings, equipped with lever locks or bolts.

The tight-head drums—These are usually equipped with two small, screw-threaded openings, one $^3/_4$ in. in diameter and one 2 in. in diameter. These openings are also available in the $1^1/_2$-in. and 2.3-in. diameters. The latter has a special jumbo thread which is used for drums containing acids and other corrosive materials. Forged steel flanges are best, and they should be welded into the drums. The Metal Barrels and Drums Committee of the Manufacturing Chemists Association has developed a new drum plug and wrench which should be available to users during the year 1946.

Bilge barrels—Fabricated by cold drawing of the metal or by forming the cylinder with butt-welded joints. Bottoms are welded or brazed, and inside bottom crevices are closed by fillet welding. Lighter gauge metal can be used in the fabrication of the butt-welded drums.

Straight-sided drums—Usually constructed with welded body seams. Heads are attached by double seaming or welding, and both types are generally supported with 12-gauge chime rings, also called reinforcements. One special type is fabricated from two cold-drawn seamless cups which are welded together circumferentially. Both head chimes are protected by welded rings. I-bar rolling hoops serve to protect the



4—A final inspection is made as these 55-gal. drums leave the drying ovens where paint has been baked.

sidewalls of the drums and facilitate their handling.

These containers should be shaped to allow complete drainage. Any crevices in the chimes or depressions in the sidewalls or heads, such as beads adjacent to the rolling hoops or flanges, will collect foreign materials and thus will result in greatly complicating the cleaning operations.

Returnable drums of 55-gal. capacity are the maximum size recommended. Large drums are too heavy for safe or economical handling. The chemical industry accepted the 55-gal. size, considering it the standard for liquids.

Returnable containers for dangerous articles must meet one of several ICC specifications depending upon the classification of the products they transport. The 5 and 42 series specifications are for liquids, and the 6 series for materials of the solid type. Consolidated Freight Classification Committee Rule 40, Section 5C, governs the construction of this type of drum when used for transporting nondangerous articles.

5—This 5-gal. drum for oil has pouring spout and a large refill opening with a resealing closure.

PHOTO, COURTESY CROWN CORK & SEAL CO.



Steel drums—18 gauge and lighter

The 18-gauge, 55-gal. drum is the most popular steel container for transporting liquids. Since the end of the war, industry has returned to the general practice of using these drums as single-trip containers—now customers neither re-use drums nor sell them to reconditioners. Rule 40, Section 5C, of the *Consolidated Freight Classification* provides the specifications for these containers when used for transporting liquids that are not dangerous. Specifications 17C, 17E and 17X of the ICC governs the construction of these drums for single trips only when they carry certain liquids authorized by the ICC *Regulations for the Transportation of Explosives and Other Dangerous Articles.*

The construction of these drums includes electrically flash-welded side or body seams. The heads are secured to the bodies by double seaming. A compound of animal glue or rubber is used to make this joint liquid-tight. Rolling hoops are expanded or rolled in the bodies to facilitate handling. Series of corrugations are often rolled in the sidewalls between the rolling hoops and the heads.

Open-head drums containing levers or bolted closing rings are usually used for packing heavy liquids, shortening, greases and the like.

Tight-head drums—These drums are equipped with pressed-in flanges and these openings may be obtained in $^{3}/_{4}$-, $1^{1}/_{2}$- and 2-in. sizes, and be inserted into the drums at practical locations. Where necessary, portholes are used for complete drainage. The plugs are of the screw-thread type and are equipped with gaskets fabricated of rubber, asbestos or other satisfactory material. Metal cap seals, which are crimped over these openings with the plugs in place, are tamperproof and afford secondary seals.

Drums holding dry materials—Such drums differ in details of construction from the liquid containers. They are usually fabricated from 18- to 30-gauge steel. Drums of 28-gauge and lighter metal are used for packing hot liquids which solidify upon cooling and thereby support the containers. Usually 26-gauge steel is required for drums carrying loads up to 100 lb., 24-gauge for loads up to 200 lb. and 22-gauge for loads up to 350 pounds.

These drums are usually made with Gordon Lock or lap-welded side seams, of which the latter is stronger. Spot welding at intervals along the Gordon Lock seams adds to their strength. The heads are secured to bodies by the usual double-seamed joint. Sidewalls may be stiffened by means of rolled or expanded corrugations of varying sizes.

Drum openings

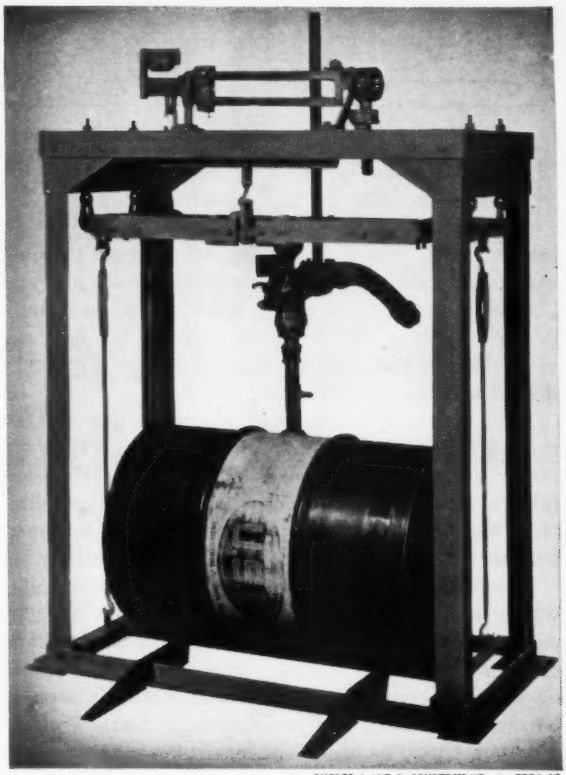
Of the variety of openings which have been devised for these containers, the most popular types are:

Friction lid—The most commonly used lid since it is an effective closure if the bearing surface between the head of the drum and the cover is sufficient to provide a tight fit. A depth of $^5/_8$ in. is adequate. Lids vary in diameter from minimum of 4 in. to a maximum of 15 inches. Such covers are generally held in the drums with three or more turnbuckles. Small holes in the ends of these turnbuckles are used to hold them in position by wiring them together. Lead seals can be applied to the wires for tamperproof closures. Friction covers are sometimes reamed or expanded. This makes an extremely tight closure, but once the lids have been removed, they cannot be used for effective re-seals.

Bolted cover—Usually specified for containers holding pastes and other semiliquids and powdered materials where large openings are desired. These lids are secured to the drum with machine screws. Gaskets are required for this cover.

Full-open heads—Held in place with metal closing rings which are drawn tight with levers or bolts. The heads of these drums are sometimes fabricated of heavier metal than used in the bodies of the containers.

Lug cover—Invariably used for closing grease drums. A sealing tool crimps the lugs under the curled portion of the heads. The user must pry out each lug with a screw driver to open the drum.



PHOTOS 6 AND 7, COURTESY VOL-U-METER CO.

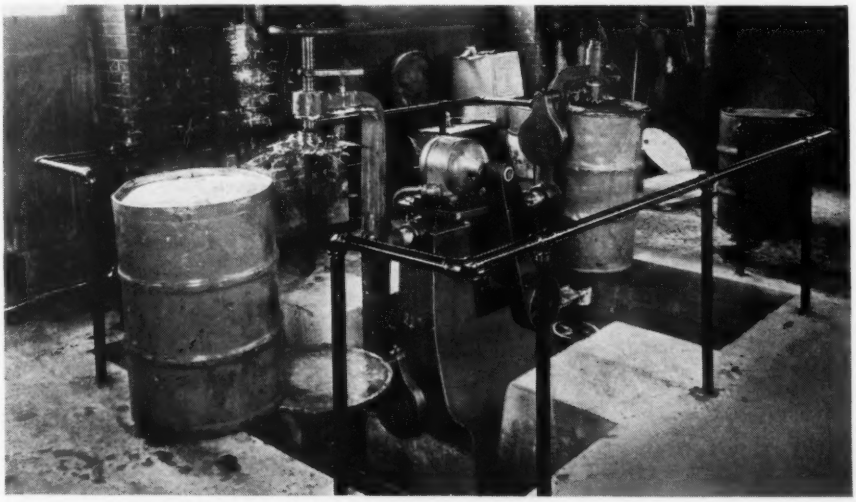
6—Drum filler with scale has all levers above the load and thus can be used with a roller conveyor.

Drum linings

Light-gauge drums used for liquids or dry materials may be "hot dipped" or sheet galvanized, tin dipped or lacquer lined to prevent contamination. There are many coatings available for lining welded side-seam drums and these must be baked at high temperatures. Sometimes double linings are required. These linings have permitted the use of steel containers for materials which formerly had to be packed in containers made of wood, glass, aluminum or in other materials.

Drum painting and decorating

Drums can be painted in one or two colors and can also be printed, lithographed and even embossed. A proper choice of colors will result in distinctive and attractive containers.



7—Drums are rolled and tumbled in this equipment which also serves as a drum cleaner. It is driven by a 2 H.P. motor and it may be equipped with a chain drive or a V-belt drive.

Fibre drums

by R. W. Lahey

Although wartime restrictions have been lifted, the fibre drum industry has many problems to solve. Paperboard is, and will be, in short supply for some time to come. However, with the exception of Pliofilm, most lining materials are now available.

Most types of fibre drums are convolutely wound. A few spirally wound types have been placed on the market in the last few years as a result of the unprecedented wartime demand.

Fibre drums are available in a large number of sizes, ranging in capacity of from $^3/_4$ to 75 gallons. They are made in diameters of from 8 to 23 inches. They are fabricated with fibre, steel or wood heads, or combinations thereof. The larger sizes are usually equipped with metal bottom rolling hoops to prevent scuffing.

Sprayed linings or impregnations of silicate of soda, waxes or other compounds, and inner plies of cellophane, glassine, Pliofilm, bleached kraft, etc., are available for product protection. Protection against transmission of moisture vapor is also supplied by asphalt barrier board and other moistureproof barriers which are usually used as one of the inner plies.

Exteriors can be lacquered or coated with pigmented paints in almost any color. They can be printed, the silk screen process being a very effective method.

Some types can be equipped with holders for tags, identification cards, etc. This device is of special interest to those industries that are required to furnish with each package detailed product data or instructions.

Fibre drums are used as containers for a wide variety of products in the following fields: chemical, drug and pharmaceutical, food, petroleum, rock products and naval stores. They are also employed for many miscellaneous products such as abrasives, adhesives, seeds, soap, explosives, cellophane, china, glassware, and so on. In general, fibre drums are used for packing dry products or materials such as asphalt which is poured hot and cast in the container. Certain constructions have been used for years for packing delicately colored urea-formaldehyde molding powders where no contamination of any type is permitted. Many valuable vitamins—often several hundred dollars worth in a container—are packed in fibre drums of extra-heavy construction. During the war, they were substituted for metal containers for some liquids and wet products such as paints, etc., but it is doubtful whether they can retain much of this business. One construction was successfully used, even before the war, for packing liquid adhesives, and shortenings and greases were packed in fibre drums as early as 1924.

Important advantages offered by the fibre drum are:

1. Freedom from contamination (loose liners are not required for some constructions)
2. Low tare weight
3. Ability to stand long storage
4. Some constructions can be sealed against pilferage
5. Ability to be easily stenciled or labeled
6. Re-use value

Fibre drums are built to comply with Consolidated

PHOTO, COURTESY U. S. ARMY SIGNAL CORPS



1—Fibre drums in strapped, palletized loads have great rigidity. Here 50-lb. weatherproof drums containing powdered milk for overseas shipment are stacked in six tiers.



PHOTOS COURTESY THE CONTAINER CO., DIV. CONTINENTAL CAN CO., INC.

2—Metal-end fibre drum at the left protected its contents in a 52-ft. drop test to a concrete floor. (Center) The drum is packed with china for the test. (Right) After the drop test, the drum is only slightly damaged.

Freight Classification Committee requirements. Fibre drums used for packing dangerous articles such as inflammable solids or class B poisonous solids, are fabricated to meet ICC Specification 21A as required by the Interstate Commerce Commission.

These drums can be tiered to any desired height if a gross weight of a thousand pounds per stack is not exceeded. They can be handled and stacked on pallets if a sufficiently large volume of drums is involved.

Dispensing devices can be fabricated which are usually conical in shape. The contents flow by gravity through a gate when the drum is up-ended.

They can also be used for mixing powdered materials when used in a tumbling device which mechanically revolves the drums end over end.

Fibre drums serve best when properly handled:

1. Drums should be moved by canting and rolling on their bottom chimes. Sidewalls, although adequate in strength, should be protected from puncture by sharp objects or crushing.
2. The best type of handling equipment is the four-wheeled dolly. Skids or pallets, transported by lift trucks, will not damage the drums. Two-wheel hand trucks may be employed.
3. Filled drums should never be dropped to the ground from the tailboards of motor trucks. They should be lowered on two or more skids, each of which is at least 4 in. wide. Narrow skids will cause excessive pressure on small areas of sidewalls which may cause distortion and thus shorten the life of these containers.
4. Certain precautions should be taken in bracing of carload and partial carload shipments to prevent gates or strapping from resting against the fibre sidewalls. All braces should rest against the top and bottom chimes. If braces cannot be located at these points, sidewalls should be protected by vertically placed wooden cleats which extend over the entire height of the drums. Drums should be packed tight from one end of the car to the other, in nested rows. Some constructions can be transported without bottom chimes riding up on sidewalls of adjacent drums, if every other row across the car is up-ended. Wooden bracing or steel bracing of the stationary or floating load systems will prove adequate if these precautions are followed.
5. Slings used in loading vessels should be of the platform, canvas or net type. Drafts should be so built up in slings as to prevent pressure.
6. Drums should be stored on their bottoms in a dry place, under cover. They should be placed on dunnage if floors are wet. They may be tiered to any desired height with or without dunnage, provided the heights are not so great as to cause buckling of the sidewalls of the drums.

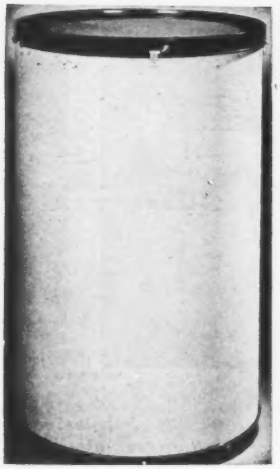
Carpenter drum, Carpenter Container Corp.—Made in a large range of sizes from a 60-gal. maximum to a 1-gal. minimum. It has a convolutely wound shell and wooden or fibre heads. The heads are held in place with electro-galvanized hinged and flanged metal rims which are locked with levers or nailed. This container complies with ICC Specification 21A as well as with Rule 41 in the *Consolidated Freight Classification*. Some constructions comply with JAN specifications.

Economy drum, Carpenter Container Corp.—Made in sizes from a maximum of 26 gal. to a minimum of 1 gallon. It also has a convolutely wound shell. The fibre heads are shaped by drawing moist fibre disks under pressure. They are fastened to the shell by the use of gummed, bias-woven cambric tape.

Leverpak drum, The Container Co. (Division Continental Can Co., Inc.)—Fabricated in sizes of 12 to 75 gallons. It has a convolutely wound shell. The bottom consists of a series of fibre trays, held in position with an electro-galvanized steel band, applied with extreme pressure. The full-open head is steel, with hard baked enamel finish, and it is held in position by an ingeniously designed and extremely efficient electro-galvanized steel locking band. This drum complies with ICC 21A Specifications as well as all requirements of Consolidated Freight Classification Committee.



PHOTO, COURTESY CARPENTER CONTAINER CORP.





PHOTO, COURTESY GAYLORD CONTAINER CORP.

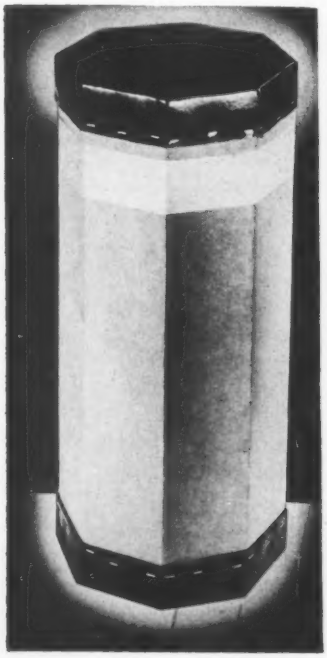
3—(Left) Laminated, convolutely wound kraft drum has wood top and bottom, metal-flange lock top. 4—(Center) Lightweight fibre drum for dry products. 5—(Right) Octagonal fibreboard containers are shipped knocked down.

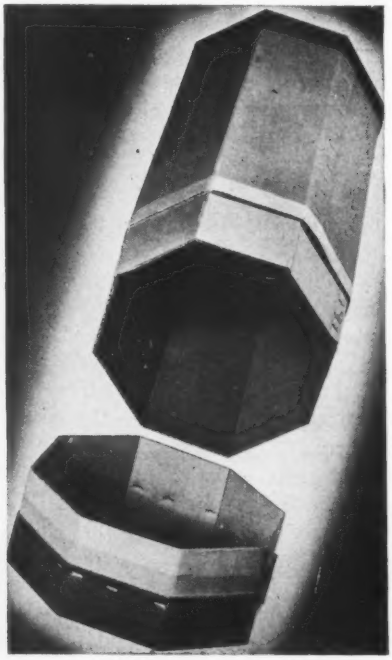
Fiberpak drum, The Container Co., (Division Continental Can Co., Inc.)—Made in sizes from $^3/_4$ to 67 gallons. The shell is convolutely wound, one end flanged inward. The bottom is formed by attaching circular disks to the flange of the shell by stitching with wire. The larger sizes are supported with an electro-galvanized hoop. A convolutely wound tube is inside this outer shell. The telescopic cover is formed in the same way as the bottom. The cover is sealed with two plies of 3-in. wide, 60-lb. kraft tape. This drum complies with ICC Specification 21A as well as with Rule 41 of the *Consolidated Freight Classification*.

Stapak drums, The Container Co. (Division Continental Can Co., Inc.)—Fabricated in sizes ranging from 2 to 32 gallons. The shell is convolutely wound and the steel bottom is attached by crimping and reinforced with wire stitching. The steel slip cover of this drum is held firmly in place by means of metal sealing lugs which are attached to the sidewalls of the drum.

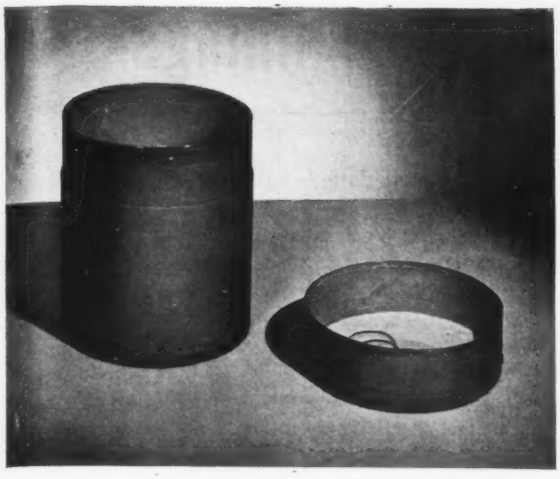
The Standard drum, The Master Package Corp.—Fabricated in sizes of 1 to 55 gal., it has a convolutely wound fibre shell. The bottom disks are held by a galvanized steel hoop that is secured to the shell. The top of the shell contains a galvanized steel protective band. The slip cover is of the same construction as the bottom. The cover is held in place with metal clips.

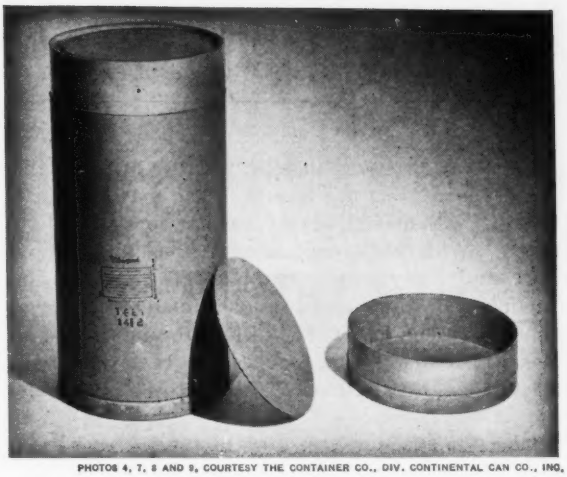
The All-fibre drum, The Master Package Corp.—Sizes 1 to 55 gal., also has a convolutely wound shell.





6—Two views of an octagonal corrugated container employed for the shipping of chemicals. Possibility of sifting is eliminated since the top and bottom are stapled. By bringing both of the outer sections to a butt and applying tape around the circumference, a strong closure is made.





PHOTOS 4, 7, 8 AND 9, COURTESY THE CONTAINER CO., DIV. CONTINENTAL CAN CO., INC.

7—(Left) Vitamins for export are first packed in 5-gal. drums lined in cellulose acetate and having protective inner covers. 8—(Right) Outer drum contains two drums shown in Fig. 7, has steel rolling chimes.

The bottom disks are held in place by a fibre head which is attached to the inside periphery of the shell. The cover, which is of similar shape to the bottom, sets inside the shell on a narrow fibre head. It is held in the drum by four metal clips attached to outer sidewall.

Steel-fibre drums—Steel-fibre drums are made in 50- and 55-gal. sizes only, and are equipped with 6-, 9- and 14-in. friction-lid openings. The shell is convolutely wound and has steel heads. These heads, of 24- to 28-gauge steel, are crimped to the fibre shells, the ends of which are doubled over and glued. This increased thickness provides a more secure anchor for the heads. It also extends the chimes beyond the plane of the sidewall, thereby providing rolling hoops when moved on smooth surfaces. Openings are of the friction type with diameters up to 12 inches.

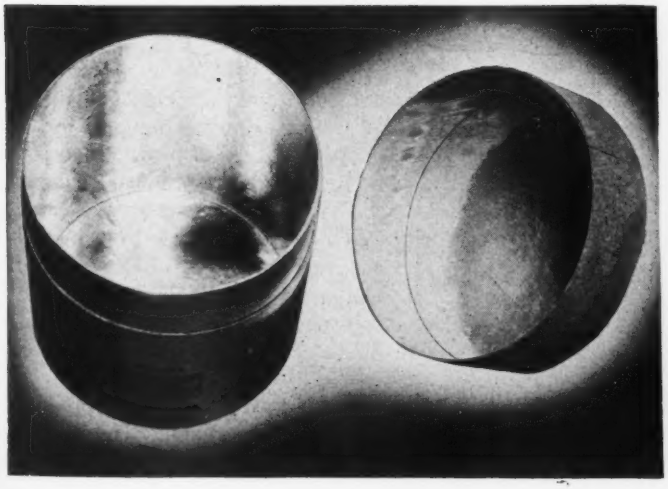
Closely related to fibre drums are hexagonal and octagonal fibre containers of special constructions used to transport powdered and briquetted materials:

Drumpak container, Gaylord Container Corp.—Octagonal in shape and fabricated from high-test corrugated board. The side seam of the shell is formed as in a fibre box, by wire stitching or with extra-heavy, 3-in. width cambric tape. Heads are interlocked with the cylinder, somewhat like the double seam of steel drums. These cover flaps are notched, forming a slight recess for the steel strapping which secures the heads to the shells. A specially designed dispensing head is available. Drumpaks are shipped knocked down.

The Atlanta Container Co. manufactures an octagonal container of corrugated board. It consists of two shells, one within another. The bottom is formed by extending the flanges of the head up over the sidewalls and securing by wire stitching. The telescopic cover, of the same construction as the bottom, is secured by gummed tape.

9—(Left) Drum with telescopic lid, when made in larger sizes, is supported by galvanized hoop. 10—(Right) Fibre drums are provided with protection against atmospheric moisture by closures of pressure-sensitive tape.

PHOTO, COURTESY INDUSTRIAL TAPE CORP.





Peacetime prospects for drum linings

by David Donovan

World War II proved that to "git thar fust with the most men" was not enough. The man who gets there first with his supplies is the man who wins modern battles. With this thought in mind, the United States Army and Navy supply requirements became both exacting and comprehensive. The materials of war had to be rushed to the most distant theaters of operations in containers that would keep these materials intact and serviceable until they reached their ultimate point of destination.

One of the factors necessary to the successful delivery of war materials was the development of special container linings. Fibre and metal shell cases required special protective coatings inside and out. Decontaminating cans had to be prepared with an especially formulated lining lacquer to withstand the deteriorating effects of chlorine solutions at varying temperatures. Water and gasoline cans used by the Army had to be lined with carefully designed lacquer since, very often, these cans were roughly dropped from truck or plane to supply fighting units, wherever they were located.

The tremendous shipment of foodstuffs of every variety to regions with temperatures ranging from the heat of the jungles of New Guinea to the icy areas of the Aleutians required specially prepared container linings suitable to these varied climes.

What does this mean to the peacetime container industry? First of all, with the end of the war, it means that material shortage which so hampered the production of linings for civilian containers will be alleviated. Unfortunately, this material shortage has by no means been dissipated to date, but it is hoped that it will not last much longer.

1—These steel shipping containers are of the full-open-head type; interior linings are baked lacquer.

PHOTO, COURTESY RHEEM MANUFACTURING CO.



Secondly, the accelerated development of new coatings and new coating methods for wartime needs, will undoubtedly provide improvements for application to civilian industry. For example, the United States Army specifications relating to decontamination drums resulted in the production of lacquers which would satisfactorily resist the tendency of chlorine to attack iron or steel, particularly in the presence of moisture. Such a lining may find many uses when applied to containers for the heavy chemical industry.

It is obvious that the linings used for fibre drums in which wartime foods were shipped, will find an equally fertile application in the shipment of edible products in peacetime. Special laminants used with water-impervious vegetable parchment paper are already in service as replacements for rubber hydrochloride, and undoubtedly this use will be developed further sometime in the not too distant future.

The special organic lacquer linings used during the war inside metal drums subject to rough handling will surely find many peacetime applications. So will linings designed to prevent water contamination. (Ordinary lacquers usually impart an unpleasant flavor to water and other liquids).

Laminants and adhesives used in fibre drums

Table I indicates the common laminants and adhesives used in fibre drums. It is considered probable that fibre drums, while their use in wartime was often the result of material shortages, will continue to find wide peacetime adaptations. They are light and easy to handle. For a great many uses, they are sufficiently durable and resistant, when properly lined, to contain many types of product.

Linings for metal drums

Linings for metal drums may be classified in five general categories. Each category is designed for the requirements of a particular type of product and is so formulated as both to protect the product from contamination through contact with the container and at the same time to protect the container from possible corrosive or deteriorating influences of the product. It is hoped that metal will soon be available so that these resistant linings may be manufactured according to former specifications. These specifications and their applications are described below.

Liner A—This lining is used for corrosive products formerly packaged in wood or glass. The coating consists of a phenolic base resin with suitable fillers

for a primer and a specific type of phenolic resin for the top coat. This two-coat system represents the highest degree of protection in container linings against the greatest variety of products.

The two-coat system is relatively expensive, not only because of the fact that two coats are applied, but because the coverage in a pigmented prime coat is necessarily low. This system is recommended only where manufacturers have been unable to accomplish satisfactory coating protection with materials which are less expensive.

Liner B—This is a phenolic type of lining, insoluble in all known solvents. It is, therefore, especially useful as a lining for packaging such strong solvents as alcohol, chloroform, acetone, varnish remover, nitrocellulose lacquer thinners, etc. It is recommended as a sanitary lining for steel beer barrels and is used extensively in this field.

Drums protected with this lining properly baked and aerated are absolutely free from oleoresinous paint and lacquer odor, and smell much sweeter than a plain steel drum. In containers intended for use requiring extraordinary protection and complete coverage, two-, three-, or even four-coat work may be performed.

Liner C—This lining is being used extensively in containers for edible fats. It is of the same general composition as Liner B, but sells at a somewhat lower price and is slightly less effective in resistance to the action of corrosive chemicals. Like Liner B, it is a modified phenolic base, insoluble in all known solvents. As in the case of Liner B, drums protected with this lining, appropriately baked and aerated, are free from oleoresinous paint and lacquer odor. More than one-coat work is not recommended with this lining. Where greater protection is required of the coating, Liner B is recommended.

Liner D—This lining is suitable for drums intended to contain edible oils, lubricating oils, greases, industrial and transformer oils. It is a very high-grade lining of the synthetic oleoresinous type, and is the most widely used lining on the market for hydrogenated edible oil products, such as Crisco, Primex, Snow-Drift, Spry and others of this type.

Liner E—This liner is recommended for use in connection with hydrogenated edible oils. It is of the same general character as Liner D, but it is an oleoresinous type of a somewhat lower quality, compounded primarily to meet requirements for a lower-priced product. It has been approved for hydrogenated oils and other edible products. Where the container is definitely employed as a one-time shipper, this liner is satisfactory.

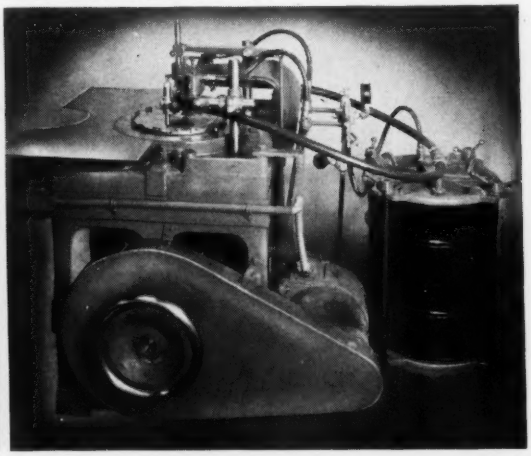
TABLE I—LAMINANTS, LININGS AND SEALERS FOR FIBRE DRUMS

LAMINANTS AND ADHESIVES
Water-soluble
Silicates, vegetable glues, animal glues
Water-insoluble
Waxes
Asphalts
Lacquers—solvent and emulsion types
Resins—solvent and emulsion types
Chemically resistant
Resins
LININGS
Chemicals (solvent and emulsion types)
Vinyl resins
Phenol-formaldehyde
Oleoresinous varnishes
Lacquers
Silicates
Thermoplastics (hot melts)
Waxes
Paraffins
Resins
Fabricated materials
Vegetable parchments
Greaseproof papers
Metal foils
Cellophane
Rubber hydrochloride
Cellulose acetate
Ethyl cellulose
Glassine
SEALERS
Miscellaneous cements, rubber compounds, asphalt cements, resinous cements, pyroxylin cements

PHOTO, COURTESY VIRGINIA BARREL CO.



PHOTO, COURTESY DEWEY & ALMY CHEMICAL CO.



2—Equipment shown at the right applies linings to the covers of metal-end fibre drums at the rate of 1200 covers per hour. Drum at the left is typical of those which are handled by such machines.

Wood barrels and drums

by F. P. Hankerson

For the packaging of a wide variety of products, wooden barrels and kegs are standard containers. Although war demands took up practically the entire production of the industry, the coopers had no reconversion problems and are meeting peacetime needs.

Barrels and kegs are separated into the three main categories listed below:

Tight barrels—These are made for the shipment and storage of liquids, semisolids and extremely heavy solids where extra strength is demanded of a package. The capacity range is 1–60 gal. or greater, and the barrels can be made from several woods to suit specific purposes. For some products, they are used unlined. For other products, a lining of glue, silicate of soda, paraffin or one of the patent linings is demanded. In general, glue lining is used for all alcohol-based liquids; silicate of soda for all oil-based liquids and paraffin for all water-based liquids.

In ordering tight barrels, the buyer should state the product to be packed, the distance of shipment, method of shipment, length of storage time, etc., so that the cooper may select the proper barrel for the job.

Slack barrels and kegs—Lighter in construction than tight barrels, these are used for the shipment and storage of powders, semisolids and solids. They are not for liquids. They are made in a wide variety of sizes, ranging from small nail kegs to huge barrels. Like the tight barrels, they are made from a variety of woods. Some have tongued and grooved staves and heads; others do not. Some have beaded steel hoops; some have wire hoops; some have wood hoops, and some have a combination of the three. For perishable products and products affected by moisture, slack barrels can be supplied with bag liners.

Buyers of slack barrels should be sure to get the proper barrel for their products. To ensure this, inform the cooper of the product, method of shipment, distance to be shipped, length of time in storage and other pertinent facts.

Beer barrels and kegs—Designed for the shipment, storage and dispensing of malt beverages, these barrels come in two styles: with solid oak staves and heading or with laminated staves and heading.

Here are some general rules for handling barrels:

1. Store slack barrels on end.
2. Store tight barrels on the bilge, always with the bungstave up.
3. Never roll a barrel on the chime, or end of the staves. Roll it on its bilge, or side.
4. Do not knock the head of a barrel out with a hammer. Consult your cooper and he will show you how to remove it properly.
5. Never let a loaded barrel drop. Although a cooperage has great strength because of its double-arch construction, no package is entirely indestructible.

1—(Left) Barrels for shipping come in a range of sizes. 2—(Right) Transporting tight barrel from warehouse to a chemical plant. Tight barrels are used to ship liquids, semisolids and extremely heavy solid materials.

PHOTOS, COURTESY ASSOCIATED COOPERAGE INDUSTRIES OF AMERICA, INC.





Wooden boxes

by Henry A. Wolsdorf

Few new types of commercial wooden shipping boxes have been developed in recent years, for the general style patterns, thoroughly proved in all kinds of service, have been well formulated for some time. It has been in the application of these adequately designed containers that the important developments have occurred.

For the general use of box designers, it has been found expedient to classify contents into three types of load, determined by the extent to which the contents support the box, the protection that the box must provide for the contents and the action of the contents on the box itself. By classifying the contents into load types, the designer can more readily prepare specifications for a box which will deliver the contents to destination economically and in usable condition.

Type 1 load

Type 1 load, usually called an easy load, is defined as a single article that fits snugly into the shipping box and comes into contact with the entire area of each face of the box. In addition, the article must have sufficient strength to withstand the rigors of handling and transportation, even if it is not boxed. The shipping box is used to prevent scratching, marring or puncturing the contents, or for protection of the contents against the weather.

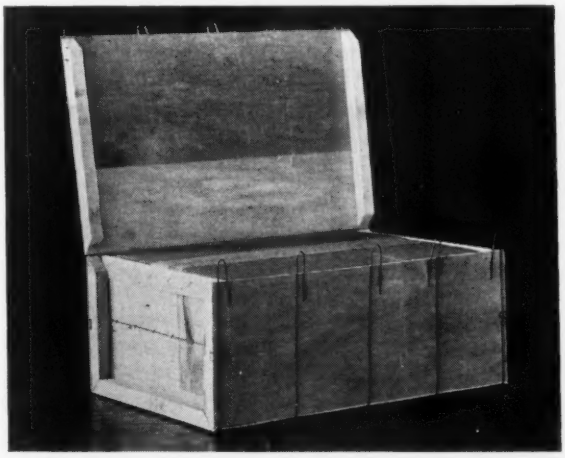
An example of this type of load is shown in Fig. 1. The corrugated container containing the contents is placed inside of the wirebound shipping box to protect it against severe weather conditions during transportation and in storage. If this protection were not provided, the corrugated container would possibly disintegrate and fail to deliver the contents to destination in usable condition.

Also in the category of Type 1 loads which are packed into shipping boxes are tool kits, metal or wooden chests and sturdy instruments in cases.

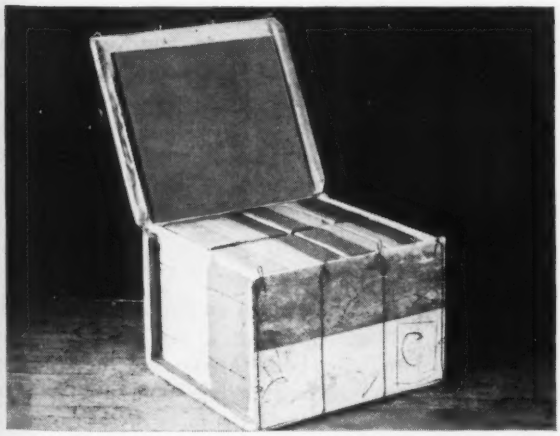
Type 2 load

A Type 2 load can be defined as an article of moderate density which completely fills the box and gives some support to all faces of the box. This is usually referred to as an average load. The pressure exerted by the contents on any face of the box is rather uniformly distributed over the box face. Some of the many kinds

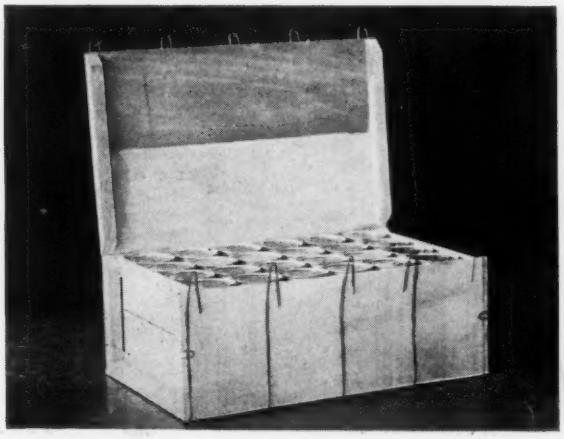
1—Type 1 load: Single article fits snugly, and contacts all of the faces of the shipping box.

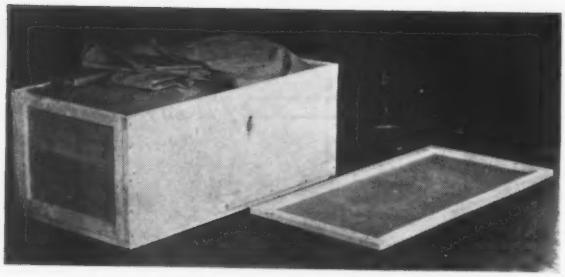


2—Type 2 load: Four articles completely fill the shipping box, and fully contact all of its faces.

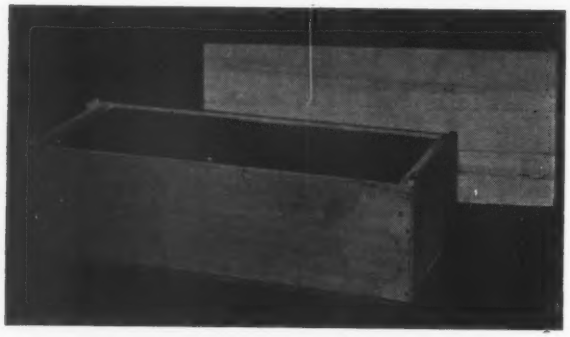


3—Type 2 load: In this example, canned goods completely fill the shipping box, and support faces.





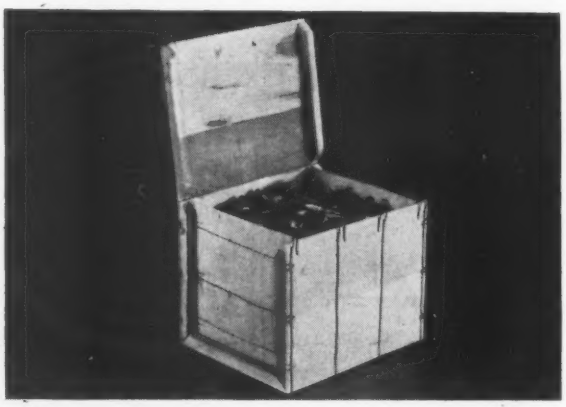
4—Type 2 load: Shipping box is filled with clothing, compressed to completely fill the container.



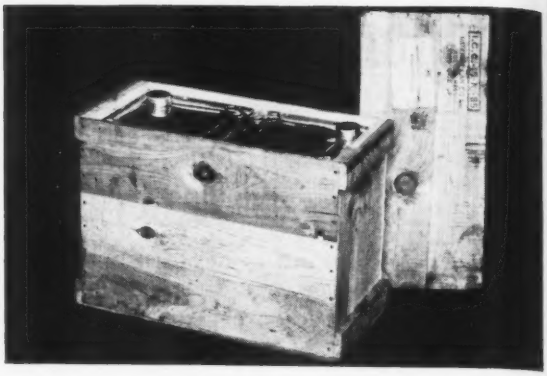
6—Type 2 load: Cartons of hardware are packed so that they completely fill inside of shipping box.



7—Type 2 load: Packaged hardware; all voids are filled with excelsior, firmly pressed into place.



8—Type 3 load: Railroad spikes do not support the faces of the box, and form a loose, shifting load.



5—Type 2 load: The two cans are held securely in place by filler piece which also protects the caps.

of Type 2 load and the conditions under which they must be packed are discussed below.

Figure 2 illustrates a Type 2 load which comprises a group of cartons. If a single such carton were packed into a box, it would be a Type 1 load.

Canned goods, completely filling the shipping box, as shown in Fig. 3, are very common examples of Type 2 loads. A general assortment of packaged goods also produces a Type 2 load, providing all the voids are tightly packed with excelsior or similar packing material.

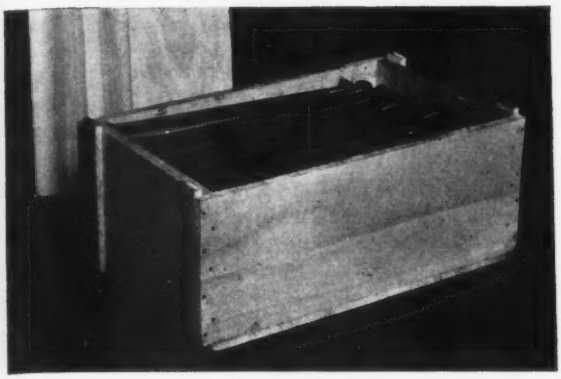
Another common Type 2 load is clothing packed into a shipping box as illustrated by Fig. 4. The clothing must be compressed or packed tightly in the box.

It frequently is necessary to pack articles having one irregular face, in which the projecting caps present a problem. The square cans shown in Fig. 5 are typical examples. In order to meet the requirements of the Type 2 load, some means must be provided to distribute the pressure of the irregular surface over the face of the box with which it may come in contact. In this case, a board may be laid over the flat portion of the cans. The thickness of the board should be such as to contact the inner face of the top when the box is closed. With this arrangement, the cap is adequately protected.

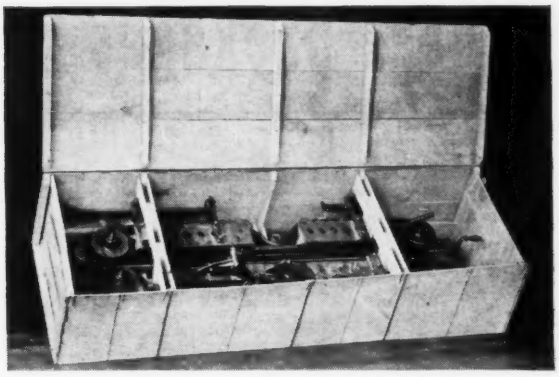
A characteristic Type 2 load occurs if packaged goods of one kind and size, such as the hardware packed in cartons shown in Fig. 6, completely fill the shipping box. Some packing departments, however, prefer to use standard sizes of shipping boxes, in which event the load of packaged goods may not completely fill the box (Fig. 7). In such instances, suitable packing material should be pressed tightly into all spaces not occupied by the articles being packed. If this is done, the requirements for Type 2 load are fulfilled.

Type 3 load

The Type 3 load, classified as difficult, includes an article or articles which do not, in general, support the faces of the shipping box. Frequently the contents form a shifting load which tends to puncture the faces of the box. Likewise, since the faces of the box may



9—Type 3 load: Problem is presented by long spikes which tend to puncture or break out of ends of box.



10—Type 3 load: Machine assemblies must be braced in shipping box to prevent contents from shifting.

not be supported by the contents, they are more readily punctured by various hazardous pressures exerted on the outside of the box.

Some articles require more than ordinary protection during transportation, and these are also classified among Type 3 loads. In general, such articles are described as fragile.

An example of a Type 3 load is shown in Fig. 8, a shipping box containing railroad spikes. The spikes form a loose, shifting load which is generally considered difficult to pack. Also typical is the box of long bolts in Fig. 9. In this pack, the bolt heads and nuts tend to puncture the top, bottom and side faces of the box. Each bolt, being free to move axially, may exert severe concentrated force on the ends of the box.

A condition frequently encountered in packing is a partially filled container. In this event, the unused space is not filled with packing material, the contents are free to shift considerably, and the pack must be classified as a Type 3 load.

Intricately shaped machine parts and machine assemblies, when packed in a shipping box, nearly always constitute a Type 3 load. It is important to provide means for preventing the machinery from shifting in any direction. Adequate interior blocking or bracing, as shown in Fig. 10 will serve for this purpose. Unless such provision is made, projecting parts may puncture one or more faces of the shipping box, resulting in damage to the box, to the contents or to both.

An example of a pack for fragile articles forming a Type 3 load is illustrated in Fig. 11. Here, again, in order to provide protection against breakage of bottles, interior packing to cushion each bottle is needed.

The preceding examples should provide a guide for the satisfactory classification into types of load of all kinds of objects which are to be packed in shipping boxes. General design data, uniform for each type of load, can then be formulated to apply to the kind of shipping service required, whether it be domestic or export. This procedure greatly simplifies the work of the box designer and enables him to establish his design information on a more factual basis.



11—Type 3 load: Fragile articles must be given adequate protection in order to prevent breakage.

Veneer packages

by Robert W. Davis

Many people think of veneer as a liquid which you apply to the surface of an article, rather than as a material from which a large quantity of shipping containers are made. There is hardly a person in this country, however, who does not come into contact with this class of container every day. Indeed, they are called upon to carry the load in moving a large amount of our commodities to market. Little romance has been woven around their manufacture. Veneer shipping containers are, in fact, a most important part of the wooden package industry.

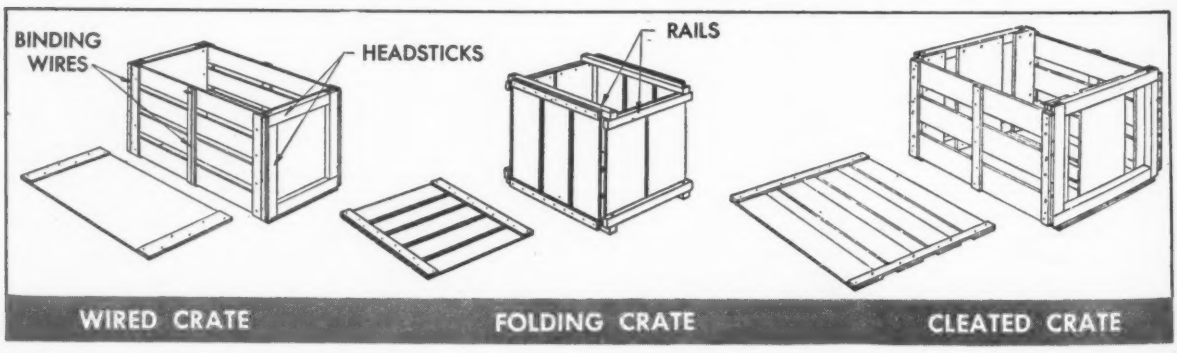
They are made principally from rotary-cut lumber, or knife-cut lumber, as it is sometimes called, although they may also be made either from sliced or from sawed material. Veneer, as defined by the U. S. Forest Service, is any thin piece of wood which may be sawed, sliced or rotary cut. Just where the dividing line between veneer and resawed lumber lies has never been accurately defined, but anything less than $^3/_8$ in. thick is generally classed as veneer while anything thicker than that would be considered sawed lumber. This difference is further substantiated in the commercial wooden box regulation issued by the Office of Price Administration, where anything over $^3/_8$ in. thick and 4 ft. long is classed as lumber. Therefore, many wooden shipping containers may contain a combination of veneer and lumber, if material thicker than $^3/_8$ in. or longer than 4 ft. is incorporated in their construction. We will confine our use of the word "veneer" to that material which is under those specifications.

Within the container industry, veneer shipping containers are generally considered as those produced principally from rotary-cut lumber, since nearly all veneer shipping containers fall into that category, though a small fraction of one per cent is produced from sliced materials. This group does not include the large number of containers produced from resawed lumber under $^3/_8$ in. thick.

Rotary-cut lumber may be used either in single thickness or in multiple thicknesses laminated with glues or adhesives, or it may be laminated by stapling the parts together with the grain of the wood running in opposite directions to increase the rigidity of the product. Laminating by stapling is the most common method, although the use of adhesive-laminated plywood containers is growing very rapidly.

Single thickness packages may be produced in connection with wood head sticks on which are stapled or nailed veneer panels. The sides, tops and bottoms of the container may be of single-thickness veneer, as in the case of the wood egg case or pineapple crate, or a unitized veneer may be used in which narrow cleats or strips unite the sides, top or bottom into one piece, making it more convenient for the packer or shipper to assemble the finished package. For egg cases, the cover must extend over the entire top, and be a clear piece of veneer, generally cottonwood, while the other parts of the container may be made of more than one piece of material—the latter, of course, represents an economy in manufacture. In egg cases, it is desirable to have an odorless and tasteless wood, which is why cottonwood is so often used. Many fruit and vegetable containers, which are subject to a great deal of moisture and rough handling, are included among the unitized veneer packages, examples of which are such popularly known shipping containers as pepper crates, vegetable crates, tangerine boxes, bushel crates and the like.

A modification of the veneer crate is the wirebound container. Fundamentally this type is composed of cleats and veneer parts, either rotary cut or resawed, but a number of encircling wires are stapled to the container, the number depending upon the amount of weight to be carried. In essence, steel is substituted for wood in this case, and there is less lumber and more steel in a wirebound container than in a cleated box. These containers are manufactured on specially designed machinery and are engineered to do specific jobs. In addition, certain of the wirebound containers have interlocking loops on the binding wires so the packages may be set up by hand and even be re-used for certain purposes.

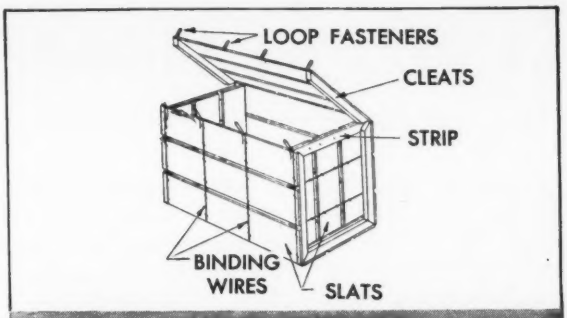


Another important type of veneer package is made of rotary-cut material encircled by special veneer hoops or bands. The finished package can be nested on these bands. Among the advantages of this type of construction is the fact that the package can be completely manufactured and the packer or shipper does not have to set up the container before it is ready for final use by the consumer. Bushel baskets, which are in this classification are manufactured in a variety of sizes and shapes. For the shipping of fresh fruits and vegetables, the sizes of such packages are governed by the U. S. Standard Container Acts of 1916 and 1928. However, these container laws only apply to the shipment of fresh fruits and vegetables, and other sizes can be manufactured and sold for other commodities. In the large container class, the most popular size is the one-bushel basket of continuous stave or short stave construction with a solid, a built-up or a fabricated bottom. This construction is similar to that used for slack barrels, but the package is much smaller and usually does not have the liner type of construction.

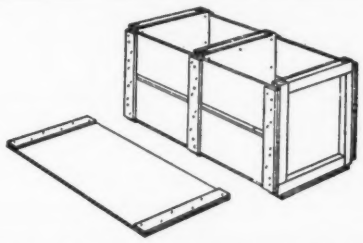
A specialized basket which is not round in shape is known as the market basket and may be made in the diamond or square braid type of construction. As a shipping container, the square braid is generally the most practical construction, although some baskets are of the slab type. The only disadvantage of market baskets is that they cannot be shipped for long distances unless the handles are detached, for they do not nest completely as do bushel baskets. Of course, the handles can be shipped detached, but in this case they must be put on by the shipper after he receives the packages, an operation which is no more trouble than assembling a box or crate from its shook form.

Another broad classification of the veneer package is known in the industry as "small goods" and comprises berry boxes (both the pint and quart sizes), as well as the tills (oblong boxes larger than quart size) and the climax baskets which are oval veneer containers with a board bottom. In this country, the climax basket is usually made in 2-, 4- and 12-qt. sizes, while in Canada there are many other sizes of climax baskets. The oblong pint basket, for example, is an exceedingly popular container for shipping strawberries from Florida during the winter months, and its use has expanded for many other commodities because it is an ideal consumer package, very attractive in appearance. The square pint has been used in recent years with a cellophane top for the shipping of fancy or cultivated blueberries, and both this and the oblong pint have become accepted consumer packages for many types of quality merchandise.

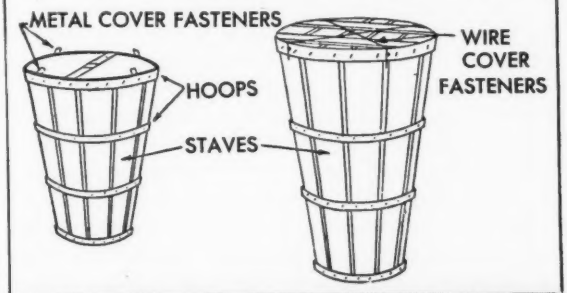
Another important type of container is the plywood package made from adhesive-laminated veneers of which the grains run in opposite directions to give the maximum strength. Weight for weight, plywood is stronger than steel, so that in this type of construction one gets a very strong package of comparatively light weight—a factor of utmost importance for any shipping container. (Also see *Wooden Boxes*, p. 853.)



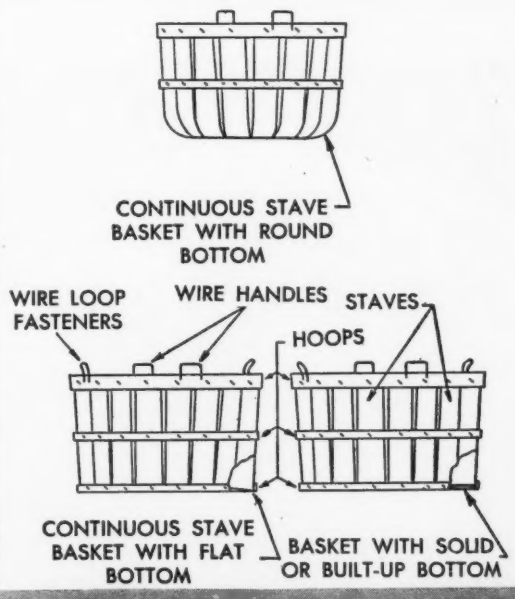
WIREBOUND CRATE



TWO-COMPARTMENT CONTAINER



HAMPERS



BUSHEL BASKETS

Carboys for shipping

by W. A. Ken

A carboy is a large glass bottle suspended in a wooden box. The protective packing mediums are cork in one form or another and rubber blocks. Sometimes salt hay packing or excelsior is used for either a single trip carboy or for a re-use carboy in the smaller sizes. The three component parts—bottle, box and packing—are together known as the carboy. Carboys have been used to transport acid since the very inception of corrosive liquids and are also used for shipping inflammable liquids.

At one time carboys were available in capacities ranging from 10 to 15 gal., the most popular in the last decade being the 12- and 13-gal. sizes. Recently, a $6\frac{1}{2}$-gal. carboy has been developed for transporting certain acids. It is built to withstand internal pressures of 10 lb. per square inch.

The manufacture of large carboy bottles involves no simple production problem. The bottles are so large, the quantities in demand so small, that it would not be economically sound to produce them by automatic machinery. The glass is gathered and partially formed by hand, then finally blown in a cast iron mold. The blowers must be highly skilled, and comparatively few are obtainable who have had such training. When the bottle is removed from the mold, slow cooling in ovens or lehrs is necessary to prevent stresses and strains.

All bottles are thoroughly inspected and tested before they leave the manufacturer's plant. The carboys are first tested by vision tests and then by striking with a small steel rod to reveal to the tester, by the sound of the reporting ring, the distribution of the glass.

To absorb shocks, a patent corner construction with rubber cushion may be used when packing carboys.

PHOTO, COURTESY AMERICAN CYANAMID CO.



In an effort to standardize the use of carboys and increase production with the same amount of available skilled labor, and also to create a stronger bottle, the Manufacturing Chemists' Association, through its carboy committee, conducted an investigation on carboy bottles. These tests were carried on through the cooperation of the Massachusetts Institute of Technology and the Gayner Glass Works, Inc.

The result of these tests was the development of the present 13-gal. M.C.A. standard carboy, with few exceptions, the universal carboy bottle today. A few 12-gal. carboys of the same general shape as the 13-gal. M.C.A. standard are still being manufactured, but for replacement in existing boxes only.

It would be difficult to estimate the average life of carboys because of the many types of box and packing material, the widely differing services they are called upon to render, and the treatment they receive from shippers and handlers. It is, however, estimated by the industry that the average life of a carboy bottle is approximately ten years. The average life of a carboy box is four years, and of the packing—depending upon the type—from one to ten years.

The value of the bottle represents about 55–60 per cent of the cost, the box about 25 per cent and the packing 15–20 per cent. It is, therefore, most logical that care be exercised in the production and handling of the bottle, and any extra protection which can be given to extend its life is economically sound.

Every complete carboy package, before being used for corrosive or inflammable liquids, must have imprinted on the side of the box the letters "I.C.C" (Interstate Commerce Commission) followed by the specification number applying to the particular purpose to which the carboy is assigned. Underneath these two groups of letters the symbol (assigned by I.C.C.) of the assembler must appear.

In an effort to avert breakage of carboys in transit and establish a standard to which all carboys must comply, the Bureau of Explosives set up a standard swing test which simulates the shock a carload of carboys going at a speed of six miles per hour would receive should it bump into a stationary object. Semi-annual tests are required, and random selections from stocks are subjected to these tests wherein the carboy is filled with water and set in a cradle attached to a 14-ft. pendulum at the base of which is a large concrete block. In order to comply with present regulations for shipments of dangerous liquids, 90 per cent of all carboys tested must withstand swing tests up to 55 in. when striking the concrete abutment on both side and bottom. All approved packages will stand this test.

Testing shipping containers

by Alfred W. Hoffman

For the first six months of 1945, freight revenue of member carriers of the Association of American Railroads increased $107,000,000, or 3.1 per cent over that for the corresponding period in 1944. That information may prove of limited interest to the average manufacturer or shipper.

But at the same time, losses and damages increased about $9,000,000, or 33.9 per cent. That fact carries a message to any individual interested in the condition of his product beyond the points of manufacture or storage, interested in minimizing delayed deliveries and inconvenience, and interested in preserving the good will of his customers.

This increase in losses and damages cannot be shrugged off as an inevitable by-product of a wartime economy. Overloads upon the nation's rail facilities and a lowered efficiency of handling and shipment were contributing factors, but no small cause was the use of defective or inefficient containers.

The cause of inefficient or defective containers can be traced to four major factors, namely: design, materials, fabrication and misuse. Design embraces the correct choice of type of container construction, shape and interior packing where needed. To cite an illustration: if a crate has cross diagonal braces, it will withstand about ten times the load applied to diagonally opposite corners that a crate with two vertical braces will withstand. Considering the packaging of dry cells as another example, the interior packing should be selected with emphasis upon protection of the relatively fragile terminal clips rather than upon the protection of the more durable metal cylinders.

Quality of materials is the next factor to be considered. It is obvious, for instance, that lumber with large knot-holes or bad cross-grain will lower the protective value of a wooden box or crate just as the use of nontest liners will result in a corrugated fibreboard container with reduced strength characteristics.

Assuming that the design and materials are satisfactory, the container may still be deficient because the fabrication is faulty. If excess adhesive is permitted to accumulate and dry on a corrugator, the corrugating material can be badly fractured and the rigidity of fibreboard boxes can thus be reduced as much as 40 per cent. Similarly, if adhesive is improperly applied to laminate the plies of solid fibreboard, the resultant imperfect bond in certain areas results in a general lowering of the efficiency of the container. Other fabrication defects which may occur in the manufacture of corrugated fibreboard boxes include imperfect scoring, wide finger lines, leaning or distorted corrugations, high-low corrugations, excessive printing pressure, defective joint, and so on.

Users can inadvertently reduce the protective qualities of their containers after they have been delivered by improper handling, storage, closure, etc. If fibreboard boxes are stored in locations which are excessively hot and dry, the moisture content may be so reduced as to cause warping or cracking. With reference to closure, improper spacing of nails on wooden boxes or crates or faulty application of tape, adhesive or metal stitches on the flaps of fibreboard boxes can nullify all the care and attention previously devoted to design, materials and fabrication. To consider but a single example, the user may be applying tape to cover only the seams of the flaps instead of covering the flap edges as well.

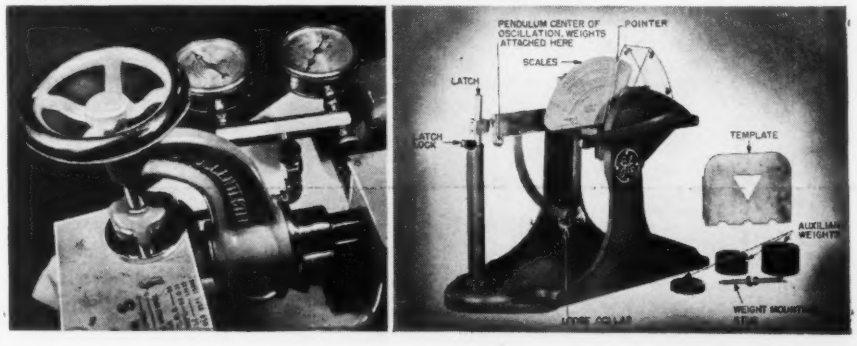
A few of the deficiencies mentioned above can be detected by visual inspection but the great bulk of them are disclosed only by performance tests. These tests, which should be carried out only after the containers have been exposed to atmospheric conditions similar to those to which they will be subjected in normal use, simulate the hazards which the containers are apt to encounter in shipment. A few are described below.

Bursting strength can be measured by the Mullen tester (Fig. 1). Operation of the machine causes hydraulic pressure to be exerted on a rubber diaphragm with a circular area of approximately one square inch and the diaphragm, in turn, bulges upward against the sample until a rupture is effected.

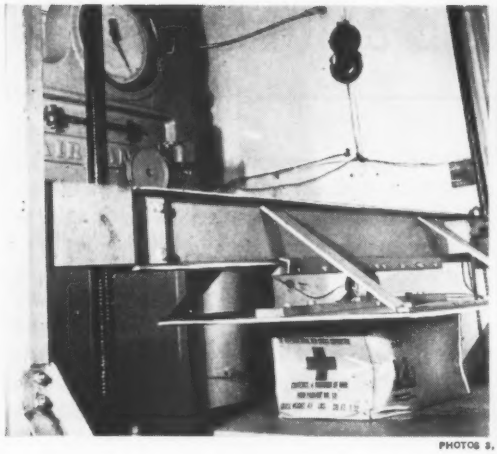
A somewhat similar characteristic, puncture resistance, is determined by use of the General Electric

PHOTO, COURTESY CONTAINER TESTING LABORATORIES, INC.

PHOTO, COURTESY GENERAL ELECTRIC CO.



1—(Left) The Mullen tester measures bursting strength, as described in the text of this article. 2—(Right) Puncture resistance of the container is determined by puncture tester.





3—(Left) A large compression machine simulates compressive stresses to which packages will be subjected. 4—(Right) Drop test is given to a container.

PHOTOS 3, 4 AND 5, COURTESY CONTAINER TESTING LABORATORIES, INC.

puncture tester (Fig. 2). Penetration of the sample is caused by a pyramidal structure on the end of an arc-like arm which is attached to a pendulum. To perform the test the pendulum is released from its horizontal starting position.

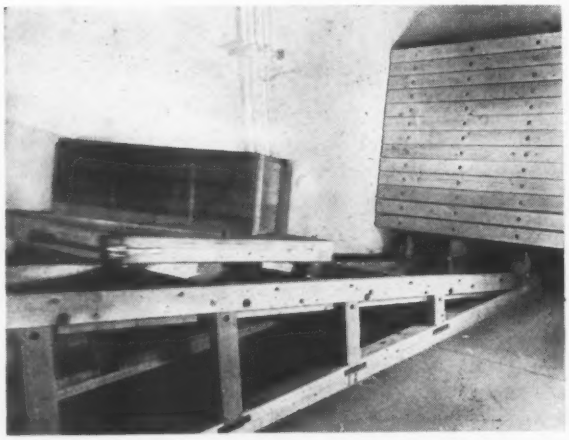
The compression test subjects the containers to compressive forces similar to those to which they may be subjected while en route in freight cars and when stored in warehouses. Each container is tested individually in the large compression machine (Fig. 3), which consists of a platform scale over which a power-driven crossbeam is mounted. The container to be tested is placed between two flat surfaces (one, the scale platform; the other, a plate under the crossbeam), and the applied pressure is read from an attached dial at each increase of 0.1 in. in the deflection or distance that the opposite surfaces of the container are forced together.

The small revolving drum test subjects the container tested to treatment closely simulating handling during transportation. The machine used in this test is usually a 7-ft. hexagonal drum resembling a large barrel placed on its bilge. On the inside faces of the drum is arranged a series of baffles which cause the container to fall on its various parts in succession as the drum revolves at a constant rate of two revolutions per minute. The number of falls which a container can withstand in the revolving drum before failure is a measure of its serviceableness. The failures occur gradually so that weakness of design and construction can be detected readily.

The drop test consists of releasing a loaded container from a known height onto a concrete floor (Fig. 4). The height can be varied, and the test can be arranged so as to have the box fall on any desired part. After testing, container and contents are examined for damage caused by the fall.

An accurate reproduction of shocks caused by impact in transit is afforded by the impact tester. The loaded container is placed upon a platform dolly which rides on an inclined plane terminating in a fixed backstop. A releasing mechanism permits the dolly to roll down the incline until it is stopped short by the backstop. The speed of descent can be varied by using different starting points. Container and contents are examined for damage resulting from the impact. (See Fig. 5.)

5—Platform dolly may be set at various speeds to measure the impact resistance of the container.



It follows from the above that the results of a well-formulated test program can show a shipper whether or not the containers he is using are efficient from the standpoint of economy and protection afforded the contents. The results can also tell him what changes are needed to provide the maximum carrying qualities at the least cost. He may find, for example, that he is over-packaging, providing more protection than is needed for the safe shipment of his product. Changes in design, such as the elimination of interior packing when the contents are not fragile and the outside container is sufficiently rigid and durable, can effect sizable economies.

On the other hand, the container design may be satisfactory but a continuous test program will enable the user to ensure that the quality of materials and fabrication is maintained in containers purchased over a period of time.

In short, a policy of testing containers will pay dividends in the form of preserving good will with minimum container expenses.

Prepacking for convenience

by Paul Meelfeld

None of us can dispute the wartime packaging difficulties which befell both manufacturers and retailers of all types of consumer merchandise. Perhaps the situation appeared more unfavorable because of the great progress that had been made in efficient packaging methods during the years preceding World War II.

But packaging "know-how" was not lacking. Even the persons who were responsible for the most glaring examples of inadequate wartime packaging, were well acquainted with the latest package engineering developments. They simply did not have the materials with which to work. They had to put make-shift on an overtime basis.

But there is always some good among the bad, and the wartime packaging situation was no exception to this rule. In the midst of their difficulties, manufacturers were able to see, more clearly than ever before, the great need for effective package engineering. Wartime conditions very forcefully emphasized the desirability of using a custom-built package for each particular type of merchandise in order to ensure complete protection and to eliminate the necessity for store inspection before delivery. Such conditions also pointed up the inefficiency of the triple handling of goods by the retailer: namely, unpacking in the receiving room, handling in storage and repacking for delivery.

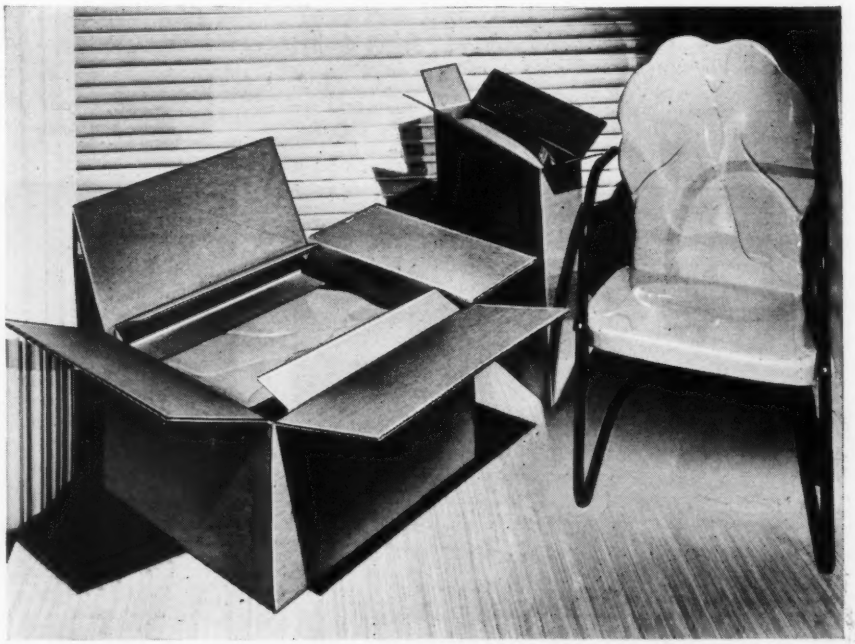
One result of this wartime experience has been the present active demand for prepacking by the manufacturer. Very shortly we shall find all types of consumer goods, from glassware sets to living room suites, arriving in the home factory-fresh—prepacked by the manufacturer and merely tagged for delivery by the retailer.

Prepacking by the manufacturer is the answer to nearly all of the needs for greater packaging efficiency highlighted so intensely during the war years. Probably prepacking's most important advantage is the reduction in over-all packaging costs. Prepacking means far less damage in transit, far fewer mark-downs due to such damage. The ultimate net profit on an item always is greater when merchandise is prepacked.

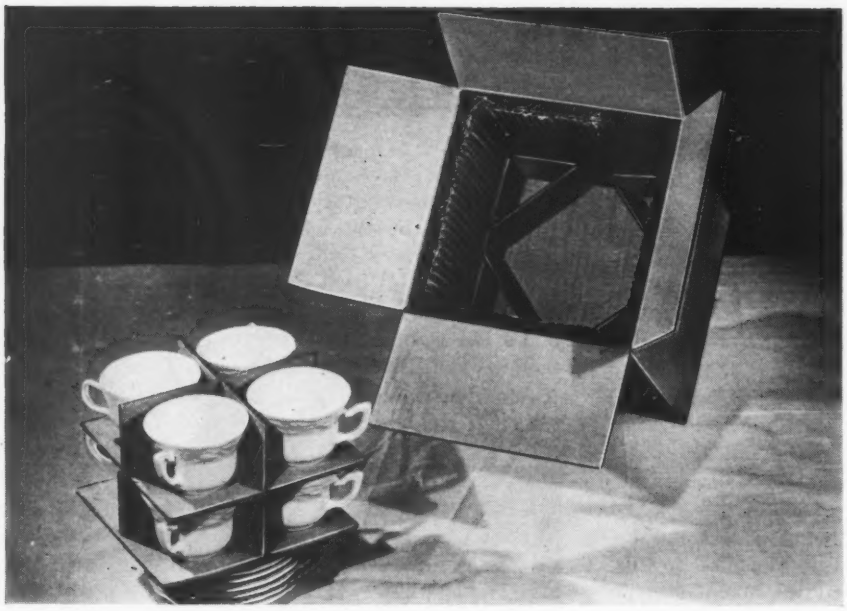


PHOTOS, COURTESY HINDE & DAUCH PAPER CO.

1—It's easy for the customer to carry home this child's set of dishes prepacked in sectional carton.



2—Prepacked furniture, packed at the factory, saves the retailer the time and money expended in unpacking, storage and repacking, and protects the merchandise from damage.



3—This 24-piece chinaware set is ingeniously prepacked. The cups and saucers are shown in a built-up unit which fits snugly into the carton; eight salad plates are already inside the box, below the pad.

With the prepacking trend now gaining momentum, these and many other advantages will soon accrue to both manufacturers and retailers. Merchandise reaching the consumer factory-fresh will build valuable good will. Attractive prepacks will add prestige to products and help to establish the name of the manufacturer and his line firmly and positively in the customer's mind.

All of these things cannot help but mean lower distribution costs and, even more important, increased sales. In addition, prepacking often increases the *unit of sale.* Many items heretofore sold individually can be grouped together and sold as complete prepacked units, reducing operating costs and increasing departmental profit margins. Sales are made from a store sample, and only the delivery tags need be attached to prepacked articles in storage. Incidentally, the storage problem itself is thus greatly simplified.

Attractive prepacks also permit effective mass displays of various types of merchandise. Prepacks can be made into dual-use display packages that help increase sales and product turnover. Examples of this are a blanket box that can be used as a home storage container and a cookie container for a picnic box.

Those who were affected by wartime packaging difficulties are well aware of the many efficiencies that will now be achieved and are cognizant of the savings prepacking effects. They are demanding prepacking for an increasingly greater number of articles. They are demanding prepacking for increased sales appeal and for greater convenience and greater savings in each of these important distribution functions: shipping, receiving, storing, selling and delivery to the consumer.

4—A handy "carry-home" prepacked container for garden tools encourages unit sales for the retailer.



5—Shockproof prepack container for glass torte plate has joined tube to hold it secure in opening.



XUM

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MATERIAL
Heat-sealable coated lead foil, kraft and cloth
Heat-sealable coated lead foil, kraft
Heat-sealable coated aluminum foil to cellulose acetate
Heat-sealing cellophane laminated to lead foil to kraft
Heat-sealable coated aluminum foil laminated to kraft
Heat-sealable coated aluminum foil laminated to laminated kraft
Heat-sealable vinyl—aluminum foil — vinyl-cloth
Vinyl films
Laminated Pliofilm
Laminated cellophane
Grade A materials
Grade C materials
Vinylidene chloride (Saran)
Creped kraft and asphaltic laminant (multiply materials)

[1] See also charts on: Prop
[2] Specifications may be obt

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PACKAGING MATERIALS FOR METAL PRODUCTS[1]

L	APPLICATIONS	SPECIFICATIONS[2]	SPECIAL PROPERTIES	CONSTRUCTION	PARTIAL LIST OF SUPPLIERS
ated lead cloth	Method II—parts, assemblies, electrical and delicate equipment, large or small	JAN-P-131 AN-P-13 AN-C-67b AXS-1414 AN-P-36a	Nearly zero water-vapor transmission; strong and durable, capable of strong heat seals	Polyvinyl butyral coated lead foil laminated to kraft adhered to cloth	Reynolds Metals Co. Shellmar Products Co. Valley Industries Western Products, Inc.
ated lead	Method II—parts, small assemblies, electrical and delicate equipment, Ration C, accessory pouch, small arms, ammunitions	JAN-P-131 AN-P-13 AN-C-67b AXS-1414 AN-P-36a	Nearly zero water-vapor transmission; strong and durable, capable of strong heat seals	Polyvinyl butyral coated lead foil laminated to kraft paper with flexible asphaltic laminated agent	Bulkley, Dunton & Co. Reynolds Metals Co. Shellmar Products Co. Western Products, Inc.
ated alu- cellulose	Foods such as beverage powders, powdered coffee, etc.	C.Q.D.—23E	Nearly zero water-vapor transmission; light weight and bulk, strong, heat sealing	Vinyl lacquer on aluminum foil laminated with colored adhesive to printed cellulose acetate	Bulkley, Dunton & Co. The Dobeckmun Co. Milprint, Inc. Shellmar Products Co. Western Products, Inc.
llophane lead foil	Bulk packaging of dehydrated foods—special uses under Method I-A	C.Q.D.—59E, 72E 74C, 60E 100-15 JAN-P-121 JAN-P-100	Nearly zero water-vapor transmission; strong, heat-sealable	Lead foil laminated to kraft with asphaltic agent. Added lacquer coating on cellophane laminated to metal side	Reynolds Metals Co. Shellmar Products Co. Western Products, Inc.
ated alu- minated	Small Method II applications such as electrical parts Certain Method I-A applications such as bearings	JAN-P-131 AN-C-67b AN-P-13 72-0-6 AXS-1414	Nearly zero water-vapor transmission; flexible, lends itself readily to automatic package-making equipment	Heat-sealing lacquer coated on aluminum foil to which a brown kraft sheet has been laminated	Bulkley, Dunton & Co. Plastic Film Corp. Rapinwax Paper Co. Shellmar Products Co. Western Products, Inc.
ated alu- minated raft	Small Method II applications, certain Method I-A applications for small metal parts	JAN-P-131 AN-C-67b AN-P-13	Nearly zero water-vapor transmission; tough, heat-sealable, high tensile strength	Heat-sealing lacquer coated to aluminum foil which has been laminated to a laminated kraft backing which has been combined by a plastic laminant	Rapinwax Paper Co. Shellmar Products Co. Western Products, Inc.
nyl—alu- l — vinyl-	Method II—parts, assemblies, electrical and delicate equipment, large or small	JAN-P-131 AN-C-67b AN-B-20	Nearly zero water-vapor transmission; very flexible, tough and heat-sealable	Cast vinyl material on aluminum foil which has been combined to a cast vinyl and cloth backing	The Dobeckmun Co. Plastic Film Corp. Shellmar Products Co.
	Waterproof flexible strong protective covers for rifles, sub-machine guns, and pistols	P.Q.D.—377B	Water-resistant, greaseproof; flexible with strong heat seals	Single-ply, heat-sealing	B. F. Goodrich Co. Carbide & Carbon Chemical Corp. Celanese Celluloid Corp. Firestone Tire & Rubber Co. Goodyear Tire & Rubber Co. Gordon-Lacey Chem. Prod. Co.
ilm	Method II—parts and assemblies, electrical and delicate equipment, large and small	AN-O-P-406 AN-P-54 AN-E-1a AN-C-67b	Low water-vapor permeability; transparent, flexible, heat-sealable	Two-ply pliofilm with flexible, strong laminating agent	Goodyear Tire & Rubber Co. Shellmar Products Co. Western Products, Inc.
phane	Food packaging, small metal parts	C.Q.D.—28G AXS-1414	Low water-vapor transmission; durable and heat-sealable, water-resistant	Flexible, heat-sealing anchored coated cellophanes with flexible, waxy laminating agent	The Dobeckmun Co. Menasha Products Co. Shellmar Products Co. Western Products, Inc.
als	Wrapper or package for precision parts—Method I or I-A (if waterproof or sealable)	JAN-P-121	Greaseproof, non-corrosive, wax free, red color	Greaseproofness is obtained by coatings, glassine, cellophane, and cellulose acetate. Strength by papers or transparent films alone, or multi-ply	Suppliers listed by Forest Products Lab.
als	Wrapper or package for precision parts—Method I-A Wrapper for cartons for method II applications	JAN-P-121 JAN-P-131	Greaseproof, non-corrosive, moldable and sealable; green color Low water-vapor transmission on certain grades	AXS-840, Revision I, is a performance specification which can be met by many materials and combinations. Greaseproofness is obtained by coatings, glassine, cellophane and cellulose acetate. Strength by papers or transparent films alone, or multi-ply, or with cloth	Suppliers listed by Forest Products Lab.
ride	Method II—same	AN-C-67b JAN-P-131	Strong, flexible, transparent, low water vapor transmission	Extruded tubes and prefabricated envelopes	Dow Chemical Co.
nd asphal- t (multi-)	Waterproof package or carton liner for many uses—special Method II applications	JAN-P-131	Flexible, tough, waterproof, pressure-sealable Low water-vapor transmission	Multi-plies of stretchable materials with asphaltic laminant	Cincinnati Industries

ts on: Properties of Flexible Packaging Materials (opp. p. 630), and Properties of Metal Foils and Foil Laminations (opp. p. 646).
may be obtained through the Department of the Navy or the War Department, Washington, D. C.

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Packaging of metal products

by W. T. Black

Most manufacturers are aware of the fact that the acceptability of a product is dependent upon the condition in which it is received by the consumer. Particularly in the packing of metal parts, they know, too, that proper handling in their packaging rooms can reduce the number of replacement parts which it is often necessary to include in shipments. The successful preservation and packaging of metal parts and assemblies for shipping and storage of military supplies during World War II provides a sound basis for the adoption, by industry, of the new methods and materials developed for this purpose. New techniques as well as new lubricants and preservative compounds, and new waterproof, water-vaporproof and other packaging materials are ready to be used for civilian products. During the war, of course, no thought was given to the attractiveness of the countless packages designed primarily for protection. Appearance is an additional consideration which must be given study for peacetime applications.

Four basic methods, outlined below, were widely used for both domestic and export shipments of war material. All have a place in the preservation and packaging of metal parts, the method depending upon the type of part. These basic techniques, together with many variants, will be outlined in this article.

Method I

Corrosion preventive compound coating, plus greaseproof wrap—This method requires that parts be cleaned, preserved and wrapped with greaseproof barrier material. Additional packing is used if mechanical protection is required.

Cleaning is a most important requirement, regardless of the method used, since corrosion can occur from the simple mistake of allowing the bare hands to come into contact with critical and corrodible metal surfaces.

The preservative used must be adequate to resist any corrosive atmosphere, water vapor and possibly water. To function properly, it must not flow off in hot weather, must not be absorbed by blocking or dunnage and must not be scraped or squeezed away.

A noncorrosive greaseproof wrapper must be used to prevent the flow of the preservative on the surfaces of the packing materials; to prevent contact of part surfaces with dunnage and blocking; to provide some protection against mechanical damage from impact and abrasion. The wrapper itself will contribute little or no protection from corrosion since the lack of sealing permits the entry of corrosive agents even if the wrapper material itself is relatively impervious to these agents. On the other hand, lack of sealing permits easy exit and elimination of any condensed vapor or water acidity.

Method IA

Waterproof unit pack, plus corrosion preventive compound coating on all corrodible surfaces—Parts are cleaned and preserved as in Method I, but the complete unit pack is made waterproof by any one of a number of different techniques. Following are those which are most commonly used:

PHOTOS 1, 2, 4, 5 AND 6, COURTESY THE DAVISON CHEMICAL CORP.



1—Dipping an assembled rifle in dual-purpose oil, which both lubricates and protects it against corrosion. Gloves protect the worker from oil, and no fingerprints are left on gun.

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2—Method II pack for dictaphone, in silica gel with metal foil barrier; sealed accessories box is above.

Method IA-1: Conforming wrap dip-coat sealed—The correct type of Grade C[1] greaseproof barrier material is applied tightly around the part. In some cases Grade A[1] greaseproof material is first wrapped around the part to prevent the transfer of wax from Grade C material to machined surfaces. The wrapped part is then dipped into the dip-coat sealing compound. This, in turn, is overwrapped in glassine or kraft paper to prevent blocking of individual packages in a container.

Method IA-2: Carton overwrapped, dip-coat sealed—The correct type of Grade A greaseproof barrier material is wrapped around the part, placed in an interior folding or set-up box (using cushioning material if necessary) and tightly overwrapped with Grade C greaseproof material. The wrapped box is dipped into the dip-coat sealing compound and overwrapped as described in Method IA-1.

Method IA-3: Greaseproof-waterproof bag, sealed—The preserved part is placed directly into a greaseproof, waterproof bag and sealed by pressure-sensitive tape, waterproof tape or heat sealed. One or more packaged parts are placed in an interior container with the necessary cushioning material.

Method IA-5: Rigid metal container, sealed—The cleaned part is wrapped in greaseproof barrier material, properly cushioned, and placed in a rigid metal container permitting only minimum void.

Method IA is one of the most important packaging techniques to be developed during the war. It is reasonably certain that metal parts such as bearings, filters, gears, oil pan assemblies, clutch pressure plates, as well as many items in the machine tool and electrical field, will be packed by this method to great advantage, particularly where parts are packed for overseas shipment or for relatively long-term storage.

It will be noted that under this method waterproof wrappings are used which are not necessarily water-vaporproof. This is emphasized by the following quotation from one of the more recent manuals.

> Many waterproof materials permit immeasurable transmission of moisture-vapor. To resist corrosion by this transmitted moisture-vapor and also by moisture condensed from included air volumes, is the function of the applied preservative. If the parts are made of corrosion-resisting alloy or are painted or plated, the applied preservative may be light or it may be left out. This, however, should only be done when it is definitely known that the plating or painting offers the protection to all surfaces, and that this protection is equivalent to that obtained from satisfactory preservatives. In any case, the combined wrap and seal must present a continuous waterproof surface. Small breaks, holes, or cuts will greatly reduce the effective life of a package or even cause excessive corrosion by retaining admitted water or other corrosive agents. As in Method I packaging, the wrapper immediately next to the part should retain preservative on parts surfaces, and be noncorrosive. This may require an extra underwrap if the waterproof paper is not both greaseproof and noncorrosive.

[1] See chart opposite p. 862.

3—Machine parts enclosed in greaseproof wrapping material, then wax-dipped, comply with Method IA.

PHOTO, COURTESY SHERMAN PAPER PRODUCTS CORP.



Method IB

Strippable compound coating—The cleaned parts are dipped in a plastic compound coating which can be readily stripped off when the part is to be put to use. The base of the plastic compounds used during the war were either ethyl cellulose or, less commonly, cellulose acetate butyrate. This type of coating probably best accomplishes the exclusion of void spaces. The tight-fitting, protective coating is applied in a molten state, cools rapidly to form a skintight layer of waterproof, abrasion-resistant, corrosion-resistant material, able to protect from mechanical damage such parts as the machined surfaces of axle shafts, complete axle assemblies, connecting rods, gears, intake and exhaust valves and all other parts having continuous external surfaces.

Method II

Dehydration—The part or assembly is first cleaned and, to assist the desiccant in corrosion protection, a light preservative is applied to any surfaces that can

be preserved. The five methods for making this Method II pack are discussed in detail in the following paragraphs.

Variations of method II

Method IIA: Floating bag—Generally, the item may be prepared by bolting to a base or skid. The base or skid material may vary from fibreboard to heavy lumber depending upon the size and weight of the part. Bolts are placed through these holes and the water-vaporproof barrier, previously preformed with the necessary gaskets, is placed over these bolts. The part is placed in the water-vaporproof barrier with a predetermined amount of desiccant after which the final closure is made by any method required for the particular type of water-vaporproof material used. This unit is then inserted in a container which will be lined with waterproof paper sealed with water-resistant adhesives.

Method IIB: Container-barrier-container—The part or assembly is placed in an interior container with a predetermined amount of desiccant with the required amount of cushioning material and sealed. The corners of the carton are broken down to prevent rupture of the barrier material. The carton is placed in a preformed bag of water-vaporproof material which is then sealed. The flaps of the barrier are folded, then the unit is placed in an exterior carton designed to fit snugly. This outer container is then sealed with waterproof tape.

Method IIC: Container overwrap—The part or assembly is properly cushioned in an interior container with a predetermined amount of desiccant and tightly sealed with tape. The closed container is overwrapped in Grade C greaseproof barrier material and dipped in a dip-coat sealing compound and overwrapped to prevent blocking as in Method IA-1.

Method IID: Cushioned bag item—All sharp projections on an item preserved and packaged under this method must be covered with neutral cellulose wadding, Grade C greaseproof barrier material or other types of cushioning. Especially designed corrugated or die-cut pads may also be used for cushioning. The cushioned item is then placed into a water-vaporproof bag with a predetermined amount of desiccant and the bag is sealed.

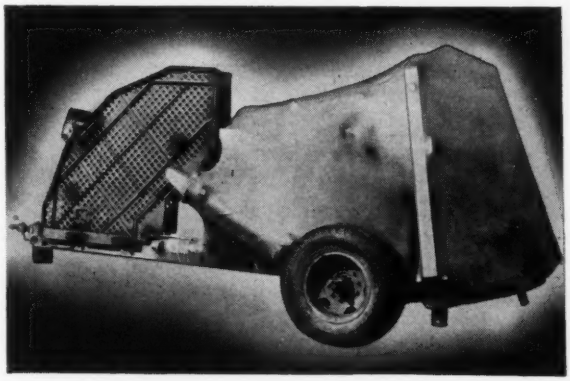
Method IIE: Rigid metal container—The item, properly cushioned, is placed in a rigid metal container containing a predetermined amount of desiccant and sealed. There should be a minimum amount of void space in the container.

The effectiveness of Method II rests equally on four interdependent factors:

1. *The volume of enclosed air space*—Relative humidity is the measure, at any given temperature, of the amount of moisture which is contained in a volume of air. The larger the volume of air to be dehydrated, the larger will be the quantity of



4—Proper marking—label is placed under band of transparent tape on IA package with Grade C wrapper.



5—Method II pack for long-term corrosion-proof storage. Complete gun package enclosed in vinyl film.



6—Another Method II pack, showing machine protected by moistureproof barrier and dehydrating agent.

moisture which must be removed to lower the relative humidity to the point where corrosion would not be expected to occur. Thus, air volume within a container should be at a minimum.

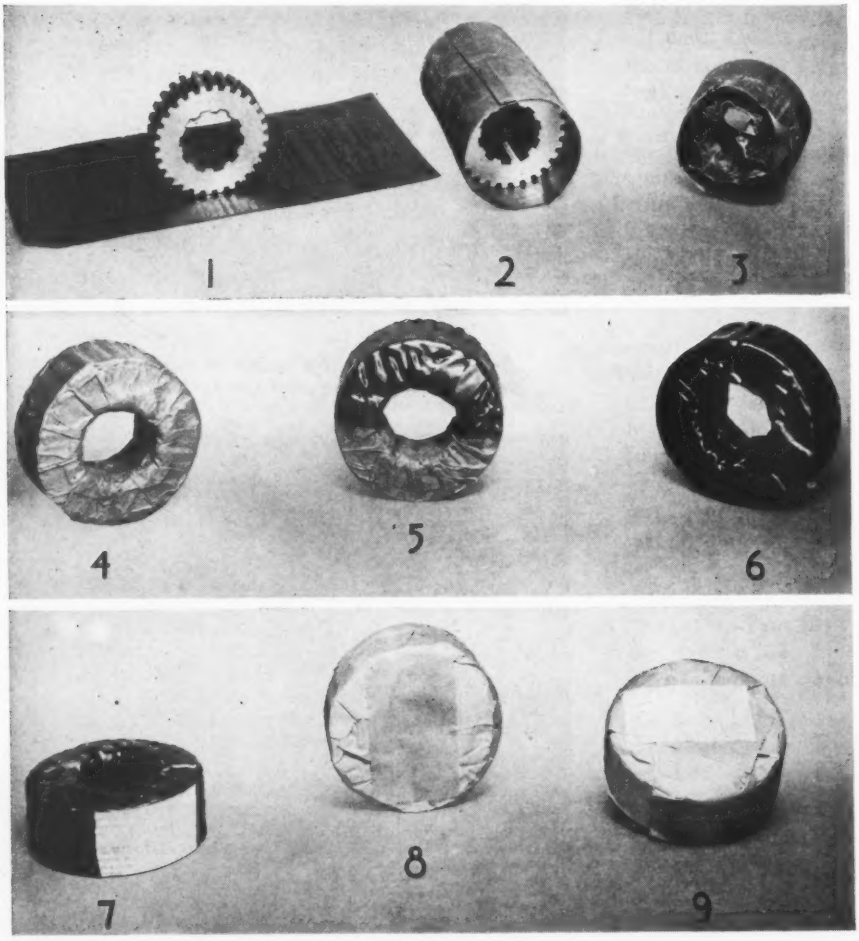
2. *The area of the surface wrapper enclosing the space*—All flexible water-vaporproof barriers are only relatively impervious to the passage of water-vapor. Consequently, the larger the surface area, the larger the amount of water vapor which will pass through the barrier. It is important that the barrier be constructed so as to result in the minimum surface area consistent with the control and volume of the assembly.
3. *The water-vapor transmission rate of the enclosing barrier*—The quantity of moisture which will be transmitted through the barrier under changing conditions of temperature and relative humidity is far greater than the amount of moisture originally contained in the enclosed volume of air. It is important, therefore, that water-vapor barrier material be chosen to fit the conditions which the package may be expected to encounter.
4. *The quantity of desiccant included in the package*—The quantity of desiccant used in a given package depends upon the total surface area of the barrier, the volume of the barrier, the amount of hygroscopic dunnage enclosed within the barrier and the length of time the item is to be protected.

The application of Method II, or dehydrated packaging, should be seriously considered for export shipments and long-term storage since it offers positive protection to complicated parts and assemblies. A partial list of equipment which may be packed by this method includes electric motors, generators, sewing machines, cash registers, business machines, sporting arms, radio and electronic equipment, complete engines (both aircraft and automotive), optical instruments, precision time pieces and typewriters.

Conclusion

Before the war manufacturers shipping such items for export have reported a high percentage of replacement parts due to corrosion damage. The experience we have gained from the development of these new methods of packaging definitely proves that this condition can be minimized—an advantage which will certainly be attractive to the manufacturers of equipment of all types.

PHOTO, COURTESY FOREST PRODUCTS LAB.



7—The nine steps specified for the packaging of a gear in a conforming-wrap type of Method IA pack: the gear is (1, 2, 3) tightly wrapped with a greaseproof material, (4, 5, 6) double-dip coated, (7) labeled, (8) overwrapped, (9) sealed and then labeled again on the outside.

Strapping of shipments

Savings in packaging materials, storage and shipping space, time and labor, experienced by manufacturers who used steel strapping during the war, will continue. Lighter containers made stronger, bundling to eliminate shipping containers, skid and pallet loading and the bracing of carload ladings are some of the lower cost developments which have been effected by flat steel bands.

The general use of special strap-applying equipment has increased the speed of packing operations. In addition to its function in reinforcement, steel strapping often reduces shipping costs by permitting the use of lighter, less expensive containers. It speeds up the handling of materials by making skid or pallet shipping practical, safe and economical.

Steel strapping also permits the baling of many items, notably textiles, which conserves shipping and storage space, yet fully protects the commodity. The use of strapping to brace carload freight has directly lessened claims for damages, cut freight bills by reducing dunnage and speeded up and simplified loading and unloading operations.

With world trade planned upon a larger scale than ever before, steel strapping will come into increased usage for all types of export shipments.

The value of reinforcing a shipping pack with steel strapping has long been recognized by the United States Government, whose *Federal Standard Stock Catalog* includes strapping as an integral part of the packing specifications for a number of commodities. These are covered by the Specifications QQ-S-781-A, 42-S-11, NN-B-621-A, all covered by the Joint Army-Navy specifications on packaging.

Steel strapping is available in two types, nailed and nailless.

Nailed strapping, necessarily confined to use on wooden boxes and crates, is held in place (usually at the extreme ends of a box) with nails. Since the application of nailed strap can seldom maintain the speed required in the modern shipping rooms, the use of it is diminishing except for certain types of export packs and for reinforcing bottle boxes, tote boxes, etc. Strapping to be nailed is annealed (soft) to facilitate nailing, although the nailless type can be purchased with nail holes already punched. (See Table I.)

Steel strapping manufacturers have kept pace with shippers' fast moving production lines in recent years by designing and perfecting equipment with which to apply nailless strapping speedily. Nailless strapping is pulled tightly around a container, bundle or bale, and then the two ends are joined together with a metal seal. Separate hand tools (stretcher and sealer) or a one-piece, semiautomatic device to apply tension, seal and cut straps speedily are available for every type of shipping pack.

Nailless strapping is ordinarily furnished in coils weighing approximately 100 lb. each; cut lengths are also available for special applications. The black painted finish is the most widely employed, although zinc-coated (galvanized) strap is preferred by some shippers for export or where it becomes necessary for packages to be stored for long periods of time. (See Table II.)

Based upon literally thousands of tests conducted by the Forest Products Laboratory (U. S. Department of Agriculture) at Madison, Wisconsin, the thickness of lumber for the top, bottom and sides of a nailed wooden box can be safely reduced 20–40 per cent when the package is steel strapped. (See Table III.)

Suggested sizes of steel strapping for various gross weights of packed containers are given in Table IV. These recommendations are general because the nature

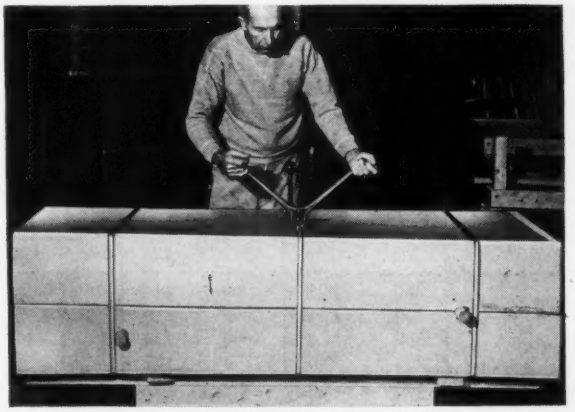
1—Cartons reinforced with galvanized high tensile steel strapping; semiautomatic bundler does tying.

PHOTO, COURTESY GERRARD STEEL STRAPPING CO.



2—Operator seals band on fibre carton, strengthened with steel strapping for protection in transit.

PHOTOS 2 AND 3, COURTESY ACME STEEL CO.





3—Heavy pallet loads of steel products are banded into a "full-floating" unit load for safe shipment.

of the product, method of handling, internal packing requirements, kind and grade of lumber used, nailing and construction are factors to be considered.

When a single strap is used, it should be placed around the middle of the box. When two straps are employed, each should be placed approximately 1/6 of the length of the box in from the ends. With three straps, the outer two should be at the same distance and the third at the middle. Three or more straps, not more than 24 in. apart, are suggested for packages which are relatively long.

By providing a greater margin of safety, steel strapping often permits the use of fibre and corrugated containers for products that would otherwise have to be packed in more expensive containers.

Two or more cartons can be strapped together to form conveniently handled units, which prevents individual packages from being lost. Only one shipping label is required.

TABLE I—NAILED STRAPPING: SIZES AND WEIGHTS

0.015 IN. THICK: LIGHT AND MEDIUM-WEIGHT PACKS

Width, in.	*Small coil*		*Large coil*		*Estimated lb. per 1000 ft.*
	Ft.	*Lb.*	*Ft.*	*Lb.*	
3/8	300	5.7	4000	76	19.1
1/2	300	7.6	3000	76	25.5
5/8	300	9.6	3000	96	31.8
3/4	300	11.5	2000	76	38.2
7/8	300	13.4	2000	89	44.6
1	300	15.3	1500	76	50.9

0.028 IN. THICK: HEAVY AND BULKY PACKS

Width, in.	*Small coil*		*Large coil*		*Estimated lb. per 1000 ft.*
	Ft.	*Lb.*	*Ft.*	*Lb.*	
1/2	300	14.2	3000	143	47.5
5/8	300	17.8	2000	119	59.4
3/4	300	21.4	2000	143	71.3
7/8	300	25.0	1500	125	83.2
1	300	28.5	1500	143	95.1

The *Express Classification* requires that packages weighing less than 10 lb. be charged at the rate for that weight, but if two or more such packages are strapped into a single unit for one consignee, the rate is based on the aggregate weight. For example, three 9-lb. packages shipped individually would be billed at the express rate for 10 lb. each or a total of 30 pounds. If these cartons were strapped into a single package for one destination, the shipper would pay on the basis of only 27 pounds.

Internal bracing of furniture is easily accomplished with steel strapping. To prevent movement and consequent damage, the product is firmly held to the base or top of the carton. The actual strapping of the container is done from the outside.

Steel strapping is used to keep the several parts of a crate in position and add the strength needed to withstand abuse in transit. As is the case with wooden boxes, the thickness of the lumber in a crate can usually be safely reduced. Whenever possible the straps should be applied around the short dimensions of the crate, over the slats. As an extra precaution, U-shaped staples are sometimes nailed into the cleats over the bands. Steel strapping is also used to brace products within the crates to prevent internal shifting. Cartons holding the separate parts can be strapped to the bottom or sides or crates of stoves, etc.

Adequate protection of such diversified products as studio couches, steel shelving, safes, metal bars, desks and mill-work is made possible with fibre or corrugated wraps held in position by steel bands. The savings in packing time and material which result from this safe practice contribute to lower handling and shipping costs, and reduces record keeping.

No general rule as to strap size can be formulated for specific products, as individual packing practices vary. However, the vast possibilities for reducing shipping costs with steel-strapped wraps warrant investigation.

As a packaging medium, steel strapping performs a most important function in the process of bundling. Since there is no container support, the straps must carry the entire weight of the load. The size and number of the straps used are determined by the weight and dimensions of the unit and the type of commodity.

The *Consolidated Freight Classification* lists certain products which are acceptable for shipment in strapped bundles or bales. Generally, they are commodities which will withstand handling in transit without the protection afforded by a shipping container. It is also permissible, under the *Consolidated Freight Classification*, to ship certain commodities in corrugated or solid fibre containers that are oversize or overweight if they are reinforced with steel strapping.

To prepare a serviceable bundle, it is necessary, in some cases, to use partial or supplementary packaging material. Wraps of corrugated or solid fibreboard, paper, or burlap, or wood cleats serve to contain the individual units within the bundle, to keep them clean and free from moisture, and to protect vital parts.

Of all packaging methods, bundling with steel strap-

ping is the least expensive because container cost is often eliminated, and little or no protective material is needed. Bundling reduces the cost of handling, counting and recording. It also prevents loss of any individual package of a group while in transit. The use of steel strapping permits the assembly and shipment of a number of smaller units as one package, which reduces the use of extra shipping labels.

Obviously many products cannot be baled, but, in general, any item which can be compressed is suitable for baling. Some of these are bags, bedding, blankets, cloth, dry goods, feathers, fur, hair, flax, hemp, hides, kapok, leather, mattresses, pulp, towels, woolens and yarns. Valuable storage space is saved, costs of transportation (especially on freighters), handling and packing are materially reduced. Burlap or waterproof paper is generally used as a covering material, and the straps are applied while the bales are under compression. Tension is not always required since, in the case of certain commodities, expansion of the bale, when released, tightens the straps and takes up any slack.

By moving production on steel-strapped skids or pallets, it is possible to speed up handling of materials, conserve storage space, reduce possibility of accidents, decrease claims for damage, increase good will of customers and substantially cut costs.

Almost every industry, whether its products are large or small, can benefit from the use of skids or pallets, both for inter-plant movement and delivery to customers. Two types of skid or pallet are used in shipping: the permanent type and the "one-way" or expendable type. The construction of the skids or pallets is important, and the entire application requires study to meet conditions of stowing, storage and customers' facilities. Manufacturers of lift trucks, pallets, skids and strapping have accumulated a wealth of available information on this subject.

The effectiveness of strapping extends also to carload ladings. Straight and mixed loads, pool and stop-over cars can also be strapped. That the carriers recommend the strapping of many commodities is evident from the publications of several divisions of the Association of American Railroads. Carriers use strapping in their terminals to brace LCL or merchandise cars.

In box cars, steel bands are applied to half-car units of freight, which permits the units to shift slightly and come to a sliding rest—shocks are absorbed through friction on the car floor. Also, bands are sometimes employed to anchor ladings in box cars, and as tie-downs for commodities loaded on flat cars and in gondolas. Tools are available for bracing all ladings.

In the case of new installations, a strapping manufacturer should be consulted since steel strapping is used most successfully when the proper equipment is installed, and the correct size of band is applied. Some packages lend themselves to automatically seal-fed strappers, mounted as an integral part of the production line; others require hand tools. In some instances movable stands for the reels are advisable while in others stationary coil holders, mounted from the ceiling or placed on the shipping floor, will permit the most efficient application of strapping.

TABLE II—STANDARD SIZES OF NAILLESS STRAPPING (WEIGHTS AND FOOTAGES ARE APPROXIMATE)

Width, thickness in.	*Ft. per lb.*	*Lb. per 1000 ft.*
1/4 × 0.015	78.55	12.73
1/4 × 0.020	58.89	16.98
3/8 × 0.010	78.55	12.73
3/8 × 0.012	65.45	15.28
3/8 × 0.015	52.45	19.10
1/2 × 0.010	58.89	16.98
1/2 × 0.012	49.06	20.38
1/2 × 0.015	39.22	25.47
1/2 × 0.018	32.75	30.56
1/2 × 0.020	29.44	33.96
5/8 × 0.010	47.13	21.22
5/8 × 0.012	39.22	25.47
5/8 × 0.015	31.41	31.84
5/8 × 0.018	26.18	38.20
5/8 × 0.020	23.32	42.45
5/8 × 0.023	20.48	48.82
3/4 × 0.015	26.18	38.20
3/4 × 0.018	21.81	45.85
3/4 × 0.020	19.63	50.94
3/4 × 0.023	17.05	58.58
3/4 × 0.028	14.03	71.28
*3/4 × 0.035	11.23	89.14
*3/4 × 0.050	7.85	127.34
*1 1/4 × 0.035	6.73	148.58
*1 1/4 × 0.050	4.77	212.24
*2 × 0.050	2.95	339.60

* Sizes generally used for bracing carload freight.

TABLE III—PERMISSIBLE REDUCTION IN LUMBER THICKNESS, THICKNESS OF SIDES, TOP AND BOTTOM OF WOODEN SHIPPING CONTAINERS*

Unstrapped, in.	*Strapped*	
	One strap, in.	*Two or more straps, in.*
7/8	5/8	1/2
13/16	5/8	1/2
5/8	1/2	3/8
9/16	7/16	5/16
1/2	3/8	5/16
7/16	5/16	1/4
3/8	5/16	1/4

* Data from Bulletin No. 14: Domestic Commerce Series; United States Department of Commerce.

TABLE IV—SIZES OF STEEL STRAPPING FOR WOODEN BOXES OF VARIOUS GROSS WEIGHTS

Gross weight of box, lb.	*Dimensions of strapping when different number of straps are used*		
	One strap, in.	*Two straps, in.*	*Three straps, in.*
50	1/2 × 0.020	3/8 × 0.015	....
100	5/8 × 0.020	1/2 × 0.020	....
200	3/4 × 0.023	5/8 × 0.020	1/2 × 0.020
300	....	5/8 × 0.023	1/2 × 0.020
400	....	3/4 × 0.020	5/8 × 0.020
500	....	3/4 × 0.023	3/4 × 0.020

XUM

Equipment for applying tape

No matter how good the box or wrapping material may be, a shipping container is no stronger than its closure. The particularly vulnerable points of any shipping container are the center breaks and the horizontal end scores. Among the most satisfactory closure materials are gummed tape and pressure-sensitive tape. (For a discussion of these materials, see *Types of Gummed Tape*, p. 568, and *Pressure-sensitive Tape*, p. 569.) Yet even a sealing material of this type may be the weak link in the development of a satisfactory shipping container, if incorrectly applied. To ensure well-sealed containers, it has, therefore, been necessary to develop special dispensing machines.

Gummed tape dispensers

History—Of the two types of tape mentioned above, the older is gummed tape, which must be moistened before it will adhere. It was not until corrugated fibre shipping containers came into use in 1912 that the necessity for gummed tape became really recognized. At the same time, it was realized that special tape-moistening machines were essential if the tape were to be used industrially for sealing shipping containers.

The first of the machines was the automatic pressure control or "chute type," which is still used today to dispense short lengths of tape. The moistening unit of this equipment consists of a brush and a pivoted pressure bar which ensures constant moistening of the tape as it passes, regardless of wear or bending of the brush bristles.

A new problem in the adhesion of gummed tape arose when industrial users began demanding a speed-up in the glue setting time of 4–5 seconds. This problem was the more difficult because, at the same time, soft coarse jute containers were being replaced by harder kraft liners which contained a certain amount of sizing for waterproofing purposes. This sizing, while improving the suitability of the containers for long trips and heavy loads, made it more difficult to secure a safe, tight seal at high speed.

Automatic moistening control equipment was developed to overcome this problem. This equipment evenly distributes a sufficient quantity of water to condition the glue as the gummed tape passes rapidly through the moistening apparatus.

Moistening features—The safety of a gummed tape seal depends upon the permanency of the grip or bond between the kraft sealing tape and the container's surface. This in turn depends upon two factors:

1. The glue must be of sufficiently good grade and suitable for the intended use.
2. By the addition of moisture, the glue must be conditioned to the proper consistency for quick, deep penetration into the dry, porous box surface where it hardens to form minute hooks, anchoring the tape permanently to the kraft liner. If too little water is added, it does not penetrate the glue, and the weak surface seal formed breaks open in a few hours. On the other hand, too much water slows up application, as the tape slides out of place and requires longer rubbing. When the high percentage of water dries out, there is left a glue solution of insufficient strength.

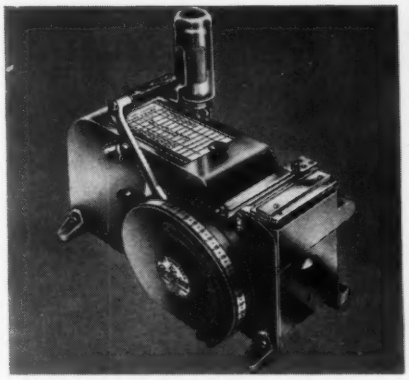
Failure of gummed tape on shipping containers most often results from faulty application rather than from defects in the tape. To assure proper application, railroad shipping executives have recommended automatic tape-moistening equipment.

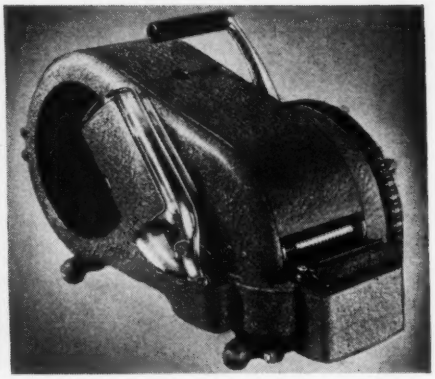
Proper moistening by such machines results from: 1) automatic control of the pressure of the tape against a water-laden brush or other moistening element, and 2) control of the amount of water supplied to the

PHOTOS 1, 3 AND 9, COURTESY NASHUA PACKAGE SEALING CO.



1—Attractive dispensers in S. S. Pierce's liquor store add to the appearance of the counter and provide tape which is suitable for wrapping small, oddly shaped packages, from which string would be likely to slip.





2—(Left) Gummed tape dispenser is fully automatic, with automatic moistening control, and is adjustable for different grades and weights of sealing tape. 3—(Right) Another fully automatic machine—a pull of the lever will automatically measure, moisten and deliver tape to the operator in the exact length required for the job.

PHOTOS 2, 4, 5, 6, 7 AND 8, COURTESY BETTER PACKAGES, INC.

moistening device. These two controls can be preset to turn out a tape that has been properly moistened to the desired degree. Adjustable water-supply control is very valuable in obtaining maximum adhesion in any season or any climate, for glue requires less moisture under hot, humid conditions than in cold weather.

An important advantage of such almost completely automatic equipment is that practically all elements of chance are eliminated in determining the degree to which the gummed tape should be moistened. By the simple pull of a handle, the tape is thoroughly conditioned for maximum adhesion. Correct moistening of tape no longer depends upon the ability of the individual applying it. Although the machines are adjustable, no fine adjustments are required, so it is not necessary for the operator to exercise his judgment in this respect. Correct moistening is thus possible even with inexperienced help.

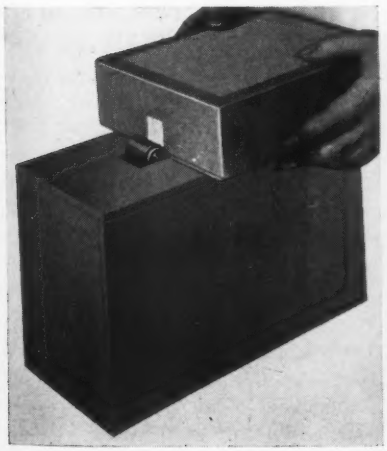
Machines may be equipped with an electrically heated water tank if shipping or packing rooms are cold. Warm water penetrates and dissolves the glue more readily than cold, thus enabling rapid adhesion without excessive rubbing.

Measuring features—Less essential than the moistening features, but still an important advantage of many of these modern machines is their tape-measuring function. Visible measuring gauges and set stops for standard lengths enable operators to obtain the desired length quickly and exactly. By use of such scientific means, it is possible to reduce to a minimum the amount of tape wasted due to any operator's poor judgment, carelessness or inexperience.

Equipment for the small package field—The small package field includes boxes, paper bags and ordinary wrapping paper, particularly for packing retail merchandise. Small packages must be wrapped securely whether they are to be carried by the shopper or sent by delivery wagon, parcel post or express.

Special advantage of gummed tape for closing small packages is that it saves time of both customer and clerk. A properly wrapped package avoids one frequent source of customers' annoyance and ill will. Gummed tape is much more suitable than string for the wrapping of odd-shaped small packages: less wrapping material is required, yet a neater, safer package results. However, although string may break or slip off an irregular package, it must be remembered that the mere use of gummed tape does not ensure a secure closure, unless it is properly moistened for uniform adhesion.

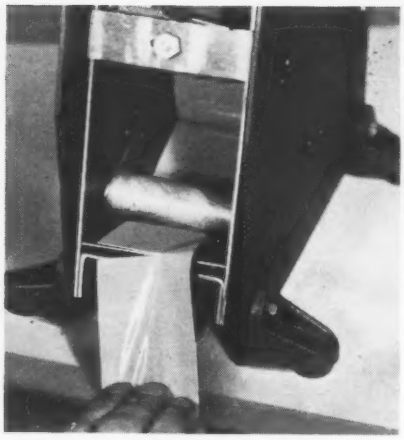
4—(Left) This unit not only dispenses, but also affixes pressure-sensitive tape to corners of boxes. 5—(Center) Multistrip dispenser used for narrow, short lengths. 6—(Right) This new machine measures as it dispenses.

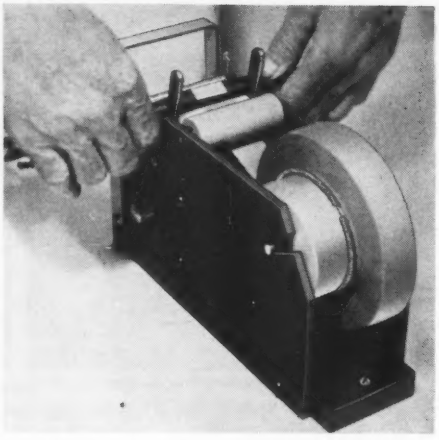






XUM





7—(Left) Two-length dispenser is employed for strips of tape which are less than 12 inches. 8—(Right) Tube-winding affixer is used for packages which are cylindrical in shape.

For this purpose, there are machines similar to those used in connection with the sealing of shipping containers. However, there is one important additional requirement. Appearance, not a vital factor in the design of tape-moistening machines for shipping containers, is quite important in dispensers of moistened gummed tape for small packages, because such devices are used to a great extent on store counters, where they can be seen by the customers.

Dispensers for pressure-sensitive tapes

Unlike the machines for gummed tape, in which the moistening features are the most important part, machines for use with the newer pressure-sensitive or tacky tapes are required merely to measure, to dispense and, in some cases, automatically to cut predetermined lengths of tape.

But development of efficient dispensing machines was even more essential in the history of pressure-sensitive tape than in the case of gummed tape. Water-resistant cellulose tapes cost roughly 28 times as much as 60-lb. kraft used for much gummed tape. When containers are sealed with a number of short strips of this comparatively expensive material, a substantial waste of tape may go unnoticed. For this reason, the most important part of a dispensing machine for tacky tape is its measuring feature. Proper dispensing of the short lengths really necessary may cut in half the quantity of tape used in a particular instance. Such worth-while economies more than pay for the machine.

Machines are available which dispense paper, cellophane or laminated materials. Different sizes handle tape of any standard width and roll size.

The varied uses of pressure-sensitive tape have determined the different kinds of dispensing machines necessary for its efficient and economical application. For instance, during the war attention was directed to machines for dispensing wide tape (3 in.) and long strips for war-related industrial uses. Currently, however, the emphasis is upon the dispensing of narrow tape (less than 1 in.) in short lengths for sealing bags, boxes, small cartons, etc. Certain models dispense, in one operation, a number of strips of tape. Some are designed for factory production sealing and may be set for predetermined lengths in the range of $^3/_4$ in. to $1^1/_2$ inches. Others are attractively designed for use on the counters of retail stores.

9—The Phillips Card Co. utilizes a battery of moistening machines to help seal boxes for mailing.



Careful time studies have been made of the motions required for proper application of short lengths of tacky tape, and the more recent dispensing machines have been designed with an eye to aiding efficient and rapid application. In accordance with this principle, one manufacturer has produced a new machine (Fig. 6) which is so designed that tape may be dispensed with one hand, leaving the other free to hold the package. Slow, uncomfortable or fatiguing motions of the operator have been eliminated. This particular machine takes up little counter space, yet is heavy enough to stay firmly in place, and tests have revealed that it may speed up sealing operations as much as 60 per cent.

Thus the use of modern machines, designed to dispense efficiently exact lengths of gummed or tacky tape, is a sound investment for a shipper; they help save employees' time, use less sealing tape and are cheap insurance against loss of merchandise, spoilage and customers' ill will and disappointment.

Materials for protecting shipments

It is a far cry from the days when excelsior was virtually the only protective material used by shippers to today when a wide variety of functional substances are at the shipper's disposal. Of recent years, these new materials have appeared in great numbers and with surprising rapidity, due largely to the impetus of war needs. The governing factors in the selection of a protective material are, of course, the nature of the product itself and the nature of the journey it must make. Most of the new materials were developed to perform very specific functions.

Similar to excelsior in character and use is shredded paper. A supply of it is readily available to any one who wishes to invest in a paper-shredding machine, and the raw material supply is no problem in any business establishment—it accumulates daily.

Many interior packing pads and cushions are available. Most of these have a wood pulp or paper base and appear under various trade names. One interesting form is the embossed crepe paper pad useful in its various thicknesses and backings for the protection of confectionery, candles, chinaware and precision instruments. One manufacturer specializes in a glassine-backed greaseproof embossed pad in numerous designs, which is obtainable with the customer's seal as a part of the design. This has been especially popular in the confectionery field.

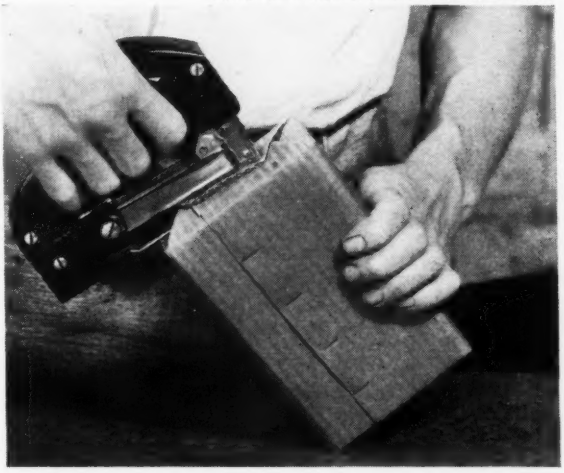
Flexible corrugated has a wide range of uses. This is similar to single-face corrugated, except that it is scored or indented in such a manner as to permit folding in any direction. This quality adapts it for use in protecting articles of varied size and shape. It is provided in roll form and is adapted for hand-packaging operations, although it is used on automatic wrapping machines.

Special types of flexible corrugated have been developed for packaging metal parts. These have corrugations of greaseproof, noncorrosive and acid-free paper, with a backing of creped kraft or 30-30-30 waterproof paper. For overseas shipment, this is used only for inner packing, but it may be used for outer packing for domestic shipments. Where production requirements call for the packing of large quantities or uniform sizes, flexible corrugated packing material may be obtained in sheets or in die-cut shapes. The wrapped package may be sealed with pressure-sensitive tape or ordinary gummed tape, tied with twine or stapled.

Another useful protective padding is in the form of a

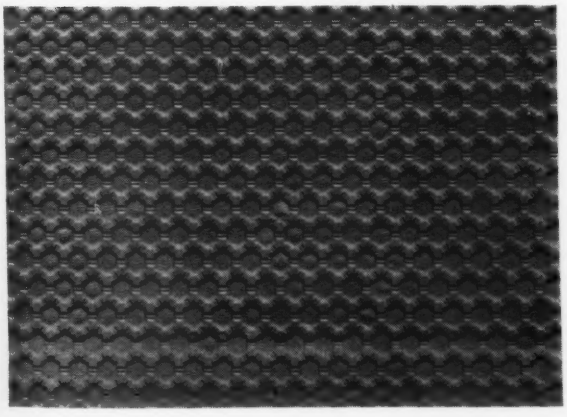
1—Affording secure wrap-around protection, flexible corrugated packages may be sealed with staples.

PHOTOS 1 AND 3, COURTESY SHERMAN PAPER PRODUCTS CORP.



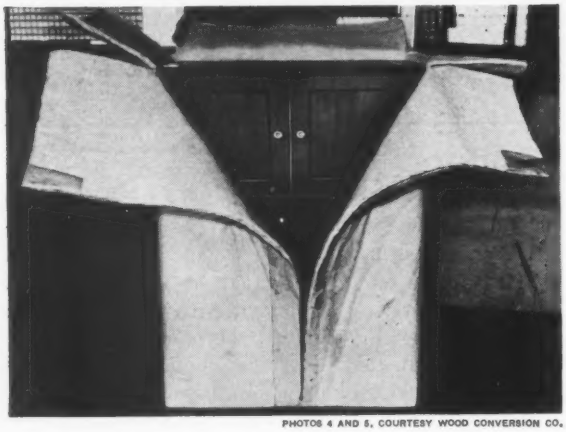
2—One of many designs of embossed crepe used for protective and decorative interior packaging of confectionery. May carry trade-mark or other design.

PHOTO, COURTESY GEORGE H. SWEETNAM, INC.



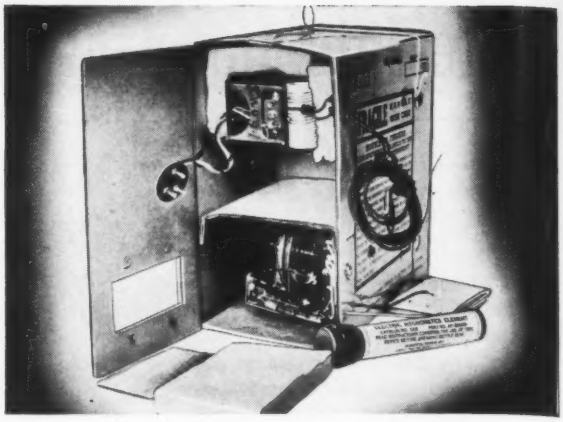
3—Flexible corrugated used as protective wrap for glass coffee maker. Buffer-like edges formed by the folds produce a light, resilient floating pack.





PHOTOS 4 AND 5, COURTESY WOOD CONVERSION CO.

4—Wood fibre blanket, 1/2-in. thickness, with kraft backing on one side, protects highly-finished bar.



5—Wood fibre blanket is used as shock-absorbing protection for a high-altitude weather recorder.

felted wood fibre blanket material adapted for the protection of precision instruments, machine parts and highly finished furniture. This blanket is made from clean new wood, which is chipped and shredded to reduce it into fibres that are felted and bonded into a fleecy mat. The material comes in various densities, processed to resist moisture, fire, mold and vermin. It is provided in rolls and its standard weight is 4 lb. per cu. ft. in the 1/4-in. thickness and it is obtainable with a backing of crepe paper or plain kraft on one or both of its sides.

Protective pads and cushions are often employed in conjunction with rigid interior packing as a facing between wooden braces or metal tape and the packaged product. Used in this manner as a buffer, creped wadding eliminates the press marking or abrasion marks that result from vibration in transit. The substance also serves to absorb shocks transmitted by external blows or concussion. In the case of breakage of bottles, creped wadding will reduce damage by absorbing liquids. Its neat, clean appearance contributes an added attractiveness and creates an impression of efficiency.

Some manufacturers of protective packing materials make their products available in the form of bags, sleeves, tubes, box liners and pads of a size and thickness appropriate for any particular product that may be packed in volume. Some protective devices, for example, are made of a fluffy filler material enclosed in a kraft paper cover. This cover may be so treated as to be water repellent and, in addition to serving as a cushion, the material also has some value as an insulation. These pads can be printed to carry an advertising message for the product packed.

One highly specialized form of protective material, made of sponge rubber, was developed during the war days and is finding a postwar commercial usefulness. Interesting example is afforded by special protective sponge rubber cushions made for the shipment of a radio transmitter tube of unusually large size. Enormous caps of sponge rubber were custom made, and these were fitted over the ends of the tube prior to its enclosure in the shipping case. This obviously expensive operation is fully justified by the delicacy and high cost of the product packaged.

Case liners and interior wraps of many varieties, developed for war uses, are finding a permanent place in peacetime shipping. Probably because of the relative cheapness of the materials, and also through attempts

6—Creped wadding, 20-ply, used for cushion between these very brittle mounted abrasive points.

PHOTOS 6 AND 7, COURTESY KIMBERLY-CLARK CORP.



7—Flask of saline solution diagonally wrapped in moisture-resistant 10-ply kraft-backed crepe wadding.



to find a single material for many uses, a number of incorrect practices have grown up. The Government Procurement Agencies continue to be large users of these protective materials. The terminology and specifications which they have adopted can be made the basis of extensive commercial use and many manufacturers, who were drafted into the production of these materials, are continuing to produce them for peacetime commerce. Brief definitions of some of the more important forms follow:

Case liners—Used inside of wooden or corrugated boxes to protect contents against the entrance of water. "Tailor made" with joints, seams and closures which afford resistance equal to that of the material itself, forming an integral continuous barrier independent of the outer container.

Interior shrouds—Used to cover products packed in fully sheathed crates to afford protection against water. So constructed as to permit free circulation of air. Particularly useful for strong protection.

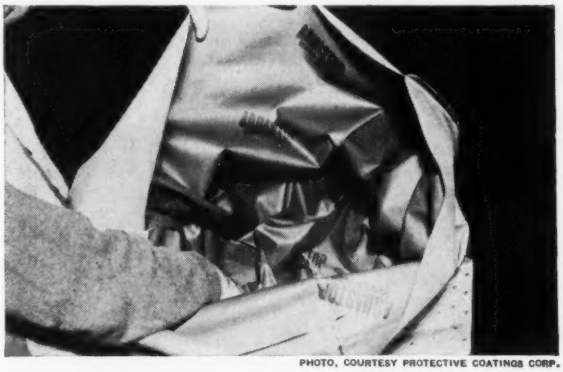
Crate liners—Used to line side, top and end panels of crates. Usually inserted between sheathing and inner diagonals, struts and braces. Crate-lining materials are separate units that do not form a continuous barrier.

Baling—Waterproof material used as a wrapping to prevent entrance of water into the baled contents. Plain kraft or creped kraft wraps the bale, and an overwrap of burlap or Osnaburg is placed outside. Wraps held in position by wire strapping.



PHOTO, COURTESY JIFFY MFG. CO.

8—(Above) Sleeve-like pads form a protective packaging for bottles of California champagne.



PHOTO, COURTESY PROTECTIVE COATINGS CORP.

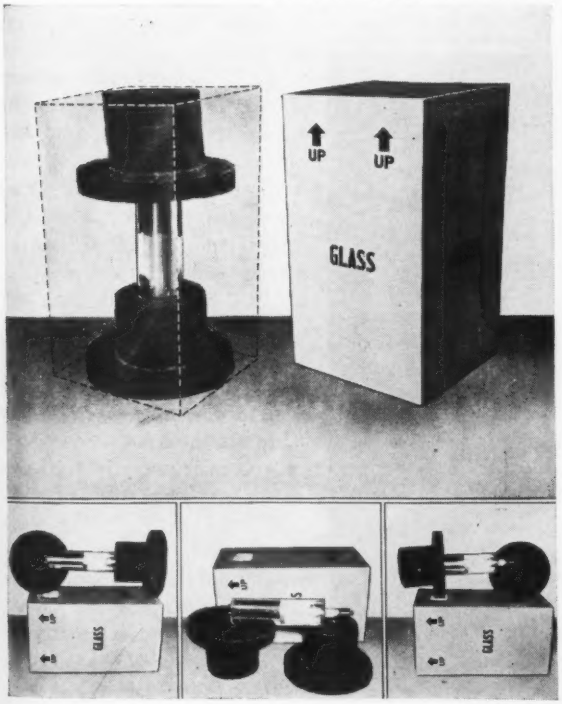
9—(Above) Waterproof interior liner for wooden shipping case forms an integral unit of protection.

PHOTO, COURTESY CINCINNATI INDUSTRIES, INC.



10—(Below) Caps of sponge rubber, fitted over ends of large radio transmitter tube, absorb shocks attendant upon shipping delicate items. 11—(Below, right) Burlap bag with liner of creped kraft paper.

PHOTO, COURTESY SPONGE RUBBER PRODUCTS CO.



Marking shipments

by Wm. A. Force III and J. R. Swift

The history of marking methods goes back to Biblical times, but labor-saving marking equipment of a speed-up nature has tended to lag behind the machines that produce goods. This was only natural, as the horse must come before the cart, and machines had first to be invented and perfected before fast production aids were possible or necessary. However, man was slow to realize how much the proper marking of materials and parts would facilitate the processing, fabricating, assembly and shipping of products, and how much it would lower the labor costs. Now, marking equipment is an integral part of production, from the starting point of raw materials through every stage of production.

During the war, the necessity for delivering the correct supplies to the proper place at the proper time required many reforms in the marking of shipments. Unification of the main elements necessary to successful shipping of all supplies was the first step taken to bring order out of confusion. The prime essential markings for overseas wartime shipments were weight, cubic contents, service code when required and sufficient space for the code address. The control data and domestic address of the shipper, as well as the consignee's name and address were, of course, included. In order to facilitate stowage on shipboard and save precious space, the means of packaging, the weight and the cubage were extremely important and, above all, the code address had to be foolproof. These were called permanent marks and all had to appear on one of the principal surfaces of the container. They were stenciled or printed, the size being in proportion to the size of the package. Generally, the weight, cubage and contents had to be indicated in the upper two-thirds of this surface, while the lower one-third was reserved for the overseas address. This was placed on the container by the contractor, or subsequently by the Army depot. The less vital markings, such as the domestic address and contract data, were placed on other panels of the container. On shipments totaling less than a carload, the name and address of both consignor and consignee were placed on one or two surfaces of the container in an area not to exceed 28 inches. Contract data markings, consisting of purchase order number, contractor's name, item number, lot number, date inspected, etc., were limited to a maximum area of 42 sq. in. and were placed preferably on the same surface as the domestic address label. The Transportation Corps, which evolved easily understood shipping and marking instructions, emphatically stressed the point that by far the most important single mark on the packaging container was the overseas address. Therefore, the largest stencil consistent with the container size was used.

Fundamentally, the principles underlying the marking system were comparable to the requirements of the Postal Department in its standardized requirements regarding the rules of marking on matter that goes via the mails. Standardization is necessary for peak efficiency. The marking system allowed for necessary variations to

PHOTO COURTESY DIAGRAPH-BRADLEY STENCIL MACHINE CORP.



1—Stencil cutting machine ensures speed in preparation and legibility of shipping directions. The machine cuts letters up to 1¾ inches in height.

meet different requirements, but the same basic principles apply to all. As an indication of the success of this system, before it was adopted departures from correct practice on shipments going overseas ran as high as 7000 a month. Shipments were marked in a fancy-free manner, with all kinds of marking agents, in letters of assorted sizes. Priceless time was lost making corrections. Industry's cooperation with procurement officers reduced incorrectly marked shipments.

The lessons learned in wartime, often painfully, should be remembered in peacetime, and carried over into normal work. The expediting which the emergency of war engendered should not be discarded, but should be made an accepted form of operation. We have found that standardization of marking was of very great help in speeding packages on their way, preventing misdirection of shipments, as well as enabling everyone from the most experienced to the most inexperienced handler to do his job more efficiently. Standardizing the position of different types of marking saves time by enabling the handler always to look in one spot when examining shipments preparatory to sorting or when looking for specific items. The use of certain relative character sizes for definite types of marking immediately stresses more important information. Sequence used in code or pattern or marks speeds understanding because the handler knows exactly where to look for the information he seeks.

Similarly, this over-all standardization enables green handlers to learn more rapidly, because it fixes the habit pattern, and condenses the learning period into a shorter space of time. The use of colors as a supplementary identification allows illiterates to do some of the sorting work previously reserved for experienced and intelligent workers. The use of serial numbering enables the checkers to sort in proper sequence, as well as to identify misplaced packages and to discern exactly how many have been misplaced. This helps to correct errors, in addition to controlling the handling of a shipment. The practice of including in the numbering code the total number of packages in the shipment, plus the package number, is generally found to be very helpful. Serial numbering is the peak of efficiency because it enables the fullest control possible to be used.

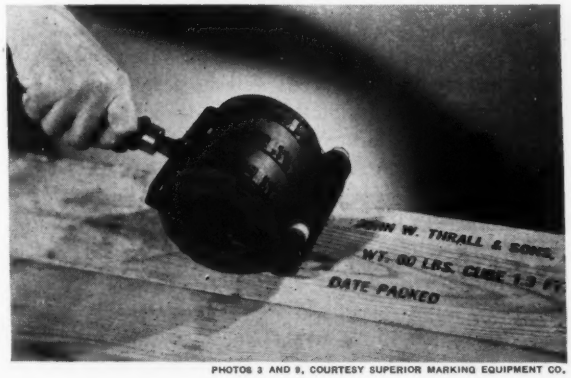
The necessity for the packaging and packing of many new and widely divergent items, and the fact that the work must often be done by inexperienced help, constantly leads to new problems of procedure. Containers have been hard to get and must frequently be re-used, adding to the difficulties. These difficulties are shared by everyone all along the line. Therefore, the shipper must not only ensure against errors in his own plant but he must also prepare shipments to undergo many hazards.

The actual equipment used for marking shipments varies not only with the shipment but with the desires of the shipper regarding speed, accuracy and whether overall economy is more important than the initial cost. But regardless of how the job of marking is done, if the address is not clear, the shipment may be lost in transit.



PHOTO, COURTESY FLUQUIL PRODUCTS, INC.

2—Re-use of containers is still important. "Salvage" paint is available, which permits re-stenciling.



PHOTOS 3 AND 9, COURTESY SUPERIOR MARKING EQUIPMENT CO.

3—Printing roll for rapid marking of information on cases has automatic re-inking rolls attached.



PHOTO, COURTESY CUSHMAN & DENISON MFG. CO.

4—For one-of-a-kind marking, new brush has automatic control valve, regulating flow of indelible ink. Lines of 3 different widths can be made with nib.



PHOTOS 5 AND 6, COURTESY ADOLPH GOTTSCHO, INC.

5—Rocker stamp and ink pad for marking of containers. At bottom are insert logotype dies for changes.



PHOTO, COURTESY WILLIAM A. FORCE & CO., INC.

6—Automatic hand case numberer used for serial and code numbering, for control of shipping records.

Therefore, whatever the method or the product, it is advisable to use only first grade equipment and material, employing them in the manner prescribed.

Stencils

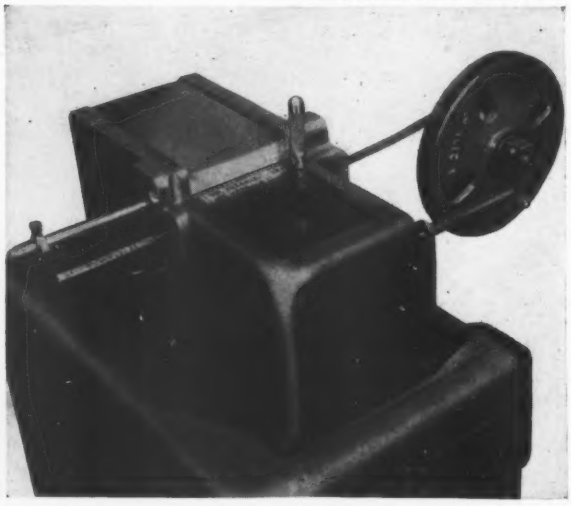
Stencils are not expensive equipment, and when they are made of brass they have the added advantages of being extremely durable as well as simple to operate. For quality marking of shipments, the stencil method has obvious advantages in both legibility and uniformity. Once the stencil has been checked as being correct, all packages marked with it will be correct as far as the reading matter is concerned. Of course, legibility requires care in handling the stencil and in applying the ink. But here, the personal desires of the shipper prevail. Most people find the ink in cake form the easiest to use with stencils, but there is a definite trend toward the liquid type ink, which can be used with the regular brush or in the fountain type brush. Recently there has become available a new development for use with thin stencils—the felt roller.

The durable brass stencil requires the use of special tools for cutting and, therefore, must be purchased from the stencil maker. The less durable board stencil is adequate for many stencils and can be cut in one's own shipping room by available machines. Machines are limited to straight line stencils, with characters ranging in size from $1/2$ in. to $1\,3/4$ inches. When special designs, export insignia or other variations are required, the hand-cut stencil is necessary. For use with the felt rollers, the lightweight cellulose acetate stencil has given good satisfaction.

When using stencils with the brushes, more care must be exercised today as the bristles are not of the same high quality formerly available. In normal times, all brushes, whether regular stencil brushes or fountain stencil brushes, were made with Chinese bristles which are superior for this hard usage. These bristles are still practically unobtainable. Therefore, it is extremely necessary that the brush tip be cleaned in order to prevent any ink build-up on the bristle. It is equally important that the proper method of application be used. This consists of a rotary motion in stenciling with a reasonably light pressure. Too much pressure or "daubing" is likely to fan the bristles out and render the brush useless.

7—Embossing machine for permanent metal shipping tags, with a slide arrangement for quick changes.

PHOTO, COURTESY JAMES H. MATTHEWS & CO.



Marking pencils and crayons

In some instances, particularly where the shipment is "one of a kind," crayons or marking pencils may be found economical to use. Marking crayons are available in various qualities for application to materials such as lumber, smooth wood and glass, or for general-purpose application. These are available in a variety of colors.

The marking pencils using ink are similar to a fountain pen, with a large reservoir for special ink. The heavy-duty units generally take the usual fluid stencil ink, while the lighter units are available with a special quick-drying ink, obtainable in six colors.

Of particular interest, while the re-use of containers remains a necessity, is the "salvage ink" available to obliterate previous markings on crates, corrugated con-

tainers and wooden boxes. The quick-drying variety is applied with a handy roller, and, it is claimed, covers the old markings with one coat.

Dies, stamps, printing rolls

In order to speed up the application of markings to large quantities of packages, especially when the marking can be done on a conveyor line, rubber dies, rocker stamps and printing rolls with and without changeable inserts have been found extremely helpful.

Rocker stamps and printing rolls, where they can be used, are among the fastest means of marking. They also increase the legibility and uniformity. The rocker stamps are inked with an auxiliary pad, using special inks which are available for practically any surface in a great variety of colors. The roller units, which are generally limited in size, do their own inking through an attached felt inking roll. Where conditions permit, units of this type can be permanently fastened to conveyor lines and the marking is easily made. Another development for conveyor line marking is a self-contained, solenoid-operated attachment which is adaptable for printing dates and codes on small areas. These conveyor units put the marks on the shipments with little or no attention, except for setting and re-inking.

Other marking methods

Frequently, shipments require that cases be serially numbered. For this job, a large hand-operated numbering machine is ideal. This type has six or seven wheels and prints figures which are $^1/_2$ in., $^3/_4$ in. or 1 in. in size. The unit is entirely self-contained with automatic advancing mechanism for the wheels, as well as an ink pad which re-inks the figures after each impression. Similarly, there is a conveyor numbering attachment for the longer standardized run.

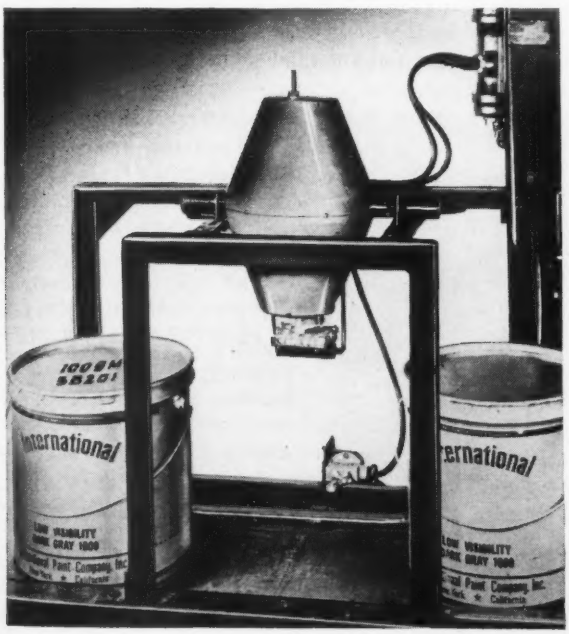
Use of numbers for the control of shipments is increasing rapidly, as it enables the shipper to identify each item, to trace lost items more rapidly and, with proper record keeping, to identify each operator's job.

When extreme durability is required, or when items are shipped loose and do not have any adequate place on which to stencil the address or markings, tags are frequently attached. For export shipment of metals and machines, these tags are frequently of metal and are either indented or embossed, depending upon the degree of legibility and noncounterfeitability required. Many machines produce such tags. Some put the marking on the tag one character at a time, while the fastest make complete tags at each pull of the lever. The quantity required by the shipper generally determines choice.

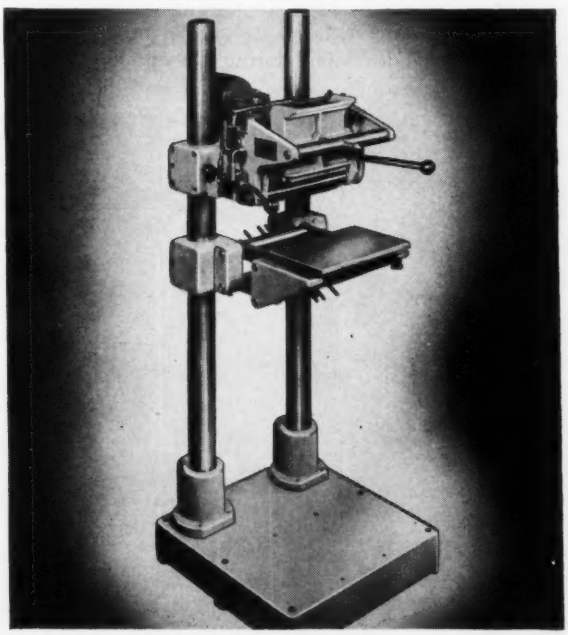
While not adapted to all products, nor in universal use, hot branding is sometimes used to mark wood cases. One advantage is its extreme durability, but it does not have the versatility of some of the other methods mentioned. When the durability of the mark is paramount, a special protective wax designed by one of the wax companies can be used as a protective coating applied to the outer surface.

We have attempted merely to outline the more popular types of equipment. Since the end of the war, new methods and equipment have been announced, and with increased mechanization, increasingly efficient marking implements will become available.

8—This unit, for automatic marking, can be attached to conveyor, packing, filling or sealing machine.



9—Machine used for marking cartons of food products prints from rubber dies and/or hand-set rubber type.



Packaging for air shipment

Compared to the well-established methods of delivery by rail and water, air transportation is a new, though rapidly growing, branch of the shipping industry. Thus, only 22 tons of express and freight traveled by air in 1927, but the figure had risen to 11,000 tons in the last prewar year. Under the impetus of military needs, there was a 650 per cent increase in air cargo during subsequent years. This means that there is actually available a capacity for handling many more consumer goods than have heretofore been sent by air. Chief deterrent remains the high cost of air transportation. However, this is rapidly dropping—from 80 cents per ton-mile a few years ago to a possible 10 cents in the foreseeable future.

In packing for air shipment, two factors must be considered—namely, the special problems created by this method of transportation and those arising from the specialized nature of the products shipped by air.

Problems of air transportation

As yet, there are few specific regulations controlling the wrapping of articles for air shipment, in contrast to the rather detailed rules applicable to other common carriers. However, common sense requires consideration of certain packaging problems of air shipment.

Altitude—Pressure changes due to high-altitude flying may cause some packages to expand and break. The pressure differential tends to vaporize imprisoned liquids and to cause leaks around closures. These are serious hazards in shipping such items as acids, flammable liquids and paints. Tightly sealed closures, absorbent packing material and special outer containers were solutions developed during the war by the AAF. The Shippers Research Division of the Air Transport Association of America has turned its attention to the problem and hopes to find a vaporproof, self-pressure-equalizing container.

Size—Due to the design of some of the older cargo planes still in use (many of which are converted passenger planes), cargo is usually hand-loaded and must be passed through small doors and packed in irregular-shaped storage space. For these reasons, items destined for air shipment should be packed in small outer containers. For shipment of a large quantity, it is usually desirable to split the order into a number of small lots for packing.

Strength—Actually, air cargo requires less strength in its shipping containers than does merchandise shipped by most other means. However, it should be noted that most articles shipped by air make part of their journey by rail, water or truck. In wartime, the saving of weight was important enough to warrant repacking of matériel at the end of the rail lap of its journey. It is questionable, however, if this procedure is now practical. Therefore, in general, an air shipping container must be strong enough for transportation by train as well as plane. Unless the established container is too heavy or bulky, it may be desirable to extend its use to air shipments. Similarly, in developing a new container, it may be desirable to design one which will be suitable for all transportation methods.

Weight—The high cost of air express, computed on a weight basis, is an important factor in determining what articles shall be shipped by air and how they shall be packed. Thus, machinery and engines, sometimes delivered by this route during the war, are seldom suitable air cargo under normal commercial conditions.

PHOTO, COURTESY ALUMINUM CO. OF AMERICA



1—Lightweight containers such as aluminum drums are ideal for use in air shipment. These 21-lb. drums were used to fly gasoline over the hump from India to China during the war.

Even lightweight items are not suitable for this method of shipment if the gross weight is high due to the use of a heavy container. For this reason, much attention has been directed toward the determination of lightweight materials suitable for air-borne packages. In fact, it is the desirability of reducing weight in order to lower shipping charges that is chiefly responsible for the designing of special air shipping packages for specific products in preference to using the otherwise satisfactory old containers. Package engineering is an important aid in selecting, for a specific product, a container of the minimum satisfactory weight.

Suitable materials and container types

Therefore, much experimentation has been conducted upon substitution of light containers for heavy ones. Wooden shipping containers, unless especially designed for air cargo, may be trouble-causers with respect to weight. Much attention has been directed toward lightening them or replacing them with other types of container.

When it is necessary to ship machinery or other bulky and heavy articles by plane, often they are not crated but are fastened to a skid or tied down. During the war, when moisture protection was necessary, they were covered with rubber hydrochloride film. Experiments were also conducted which indicated that for moisture-proof packing, a steel drum is lighter and less expensive than a combination of a wooden crate, an inner moisture-resistant flexible film and enclosed desiccant.

For most items, fibreboard or heavy corrugated boxes have proved entirely satisfactory substitutes for wooden shipping containers. They contribute sufficient strength and rigidity, yet effect a great saving in weight and therefore in shipping charges. They are also easier to handle and to load manually due to their lighter weight and the absence of splinters. Sheets of flexible corrugated material are used with good results to wrap small odd-shaped articles or bulky items.

Occasionally it is even possible to replace wooden boxes with simple bags, which are ideal from the standpoint of light weight.

For heavy loads, for which wooden boxes must be used, it is sometimes possible to replace nailed containers with wirebound boxes. The latter cost less than most nailed boxes, use less wood and yet can be lighter in weight because they take strength from wire and staples. If ten 5-pt. bottles of acid were packed in a wirebound box and flown from Chicago to Pittsburgh, the total saving (in cost of container plus air charges) would amount to 23 cents per bottle.

Another solution to the problem of weighty wooden shipping containers has been the substitution of boxes of $^3/_{16}$-in. plywood wood-framed panels in place of $^3/_4$-in. solid wooden boxes.

Even for inner packages, weight saving is worth attention. In this connection it is interesting to note the marked trend toward decreasing the weight of bottles. The glass companies have made considerable



PHOTO, COURTESY GOODYEAR TIRE AND RUBBER CO. AND HINDE & DAUCH PAPER CO.

2—Food delicacies like these brook trout wrapped in Pliofilm are successfully transported by air.

progress in this direction and another recent step has been the development of bottles of various types of plastic—polystyrene, cellulose acetate and cellulose acetate butyrate. Weight of one empty blown cellulose acetate bottle is only 35.9 g. as compared to 156.5 g. for a glass bottle of similar capacity—a saving of $^3/_4$ of the weight. Yet in a revolving drum test, the acetate bottles demonstrated a strength greater than that of the glass bottles, surviving 150 falls while glass containers broke after 46–69 falls. Use of such stronger bottles makes it possible to use lighter and less expensive shipping containers. The initial cost of a plastic bottle may be three times the cost of a glass bottle, but where large quantities are to be shipped for great distances, the total cost of package, outer container and shipping is less for plastic bottles than for glass.

Problems of packing special products

In addition to the general packaging problems which occur due to air shipment, there are other special requirements resulting from the specialized nature of the items suitable for air transportation. In addition to the desirable characteristic of light weight in such a product, there are two other common characteristics.

Perishables—In the first place, the majority of such products are perishables. The speed of air transportation is essential if they are to be marketed at any great distance from the source of supply. As Tom Girdler expressed it, "Goods shipped by air are goods which otherwise might not have been shipped at all."

However, the perishability of such items poses a number of packaging problems. Chief among these is the problem of keeping them cool. The conventional method of inclusion of ice is sometimes used, but is undesirable because of the added weight and the litter created by melting ice. Two solutions have been developed. One method is the use of a refrigerated compartment bag found in Cargoliners. This is made of

XUM

glass fibre insulation covered with vinyl-coated glass fibre cloth, and contains pockets for insertion of dry ice. The other method is to precool the perishables and then pack them in insulated shipping containers. Insulation may be a simple corrugated sheet.

Luxuries—Secondly, the typical air-borne item is a luxury, for which air freight charges are a fraction of the total cost. Parisian clothes are luxuries as are foods which are out-of-season or a specialty of a limited geographical area. In fact the classification may be considered to include any item for which the demand is great enough to warrant prices which will absorb the higher shipping costs.

Because air-shipped articles are luxury items, careful and attractive packaging is important. Thus, flowers and fruits are frequently packed at their point of origin in consumer unit packages in order to eliminate the handling in retail stores.

For similar reasons, transparent materials are often used in the packaging of air-borne perishables as a means of advertising to both dealer and consumer that the products are choice and truly fresh. Some consideration has been given to the possibility of gift packages of rigid acetate for premium quality fruit.

Suiting the package to the product

The final selection of both the unit package and the outer container depends upon the specific product. The wrappings are tailored to fit each item. This calls for careful package engineering. Discussed below are several examples of air-shipped merchandise which created special packaging problems.

3—This compartment refrigerated with dry ice was especially developed for airplane cargo. The zippered compartment is fabricated of Fiberglas cloth.

PHOTO, COURTESY UNITED AIR LINES



Flowers—Flowers were among the first items to be shipped by air and are still a staple part of air cargo between the West Coast and Eastern cities. They meet all of the requirements of typical air cargo, for they are light in weight and perishable, are grown far from their largest market and are luxury goods.

Chief purposes of the flower package are to prevent crushing of contents, to hold the flower in place within the box and to prevent excessive handling after it reaches the retail florist. Bulk packages sometimes used for gardenias are 30-pt. fibreboard trays laminated on both sides with aluminum foil and divided into compartments.

However, sometimes packaging individual flowers or corsages is deemed preferable since it cuts handling to a minimum. For this purpose, cellophane bags or windowed cardboard boxes are ideal, for they permit examination of contents without handling. High-priced orchids present a special problem which has been solved in one case by packing each orchid in soft spun glass, inserting the stem in a rubber-capped tube containing ice water and fastening it to the bottom of the box to hold it firmly in place.

Fruits and vegetables—Also from the West Coast to Eastern markets come many of the best fruits and vegetables. One company delivered 36,000 lb. per week during 1945 and planned on 60,000 lb. with the aid of new planes. Packaged in growers' sheds and precooled for 6–8 hr., goods of this company are on the market in 24 hr., yet selling price is only $1/4$ to $1/3$ above that of rail-borne items which have been 15 days in transit.

Carefully planned packages and shipping containers have been selected by this company for its produce. Three types of package, all of a size suitable for consumer sales, are used. The first is a folding carton of 1-lb. net capacity, made of laminated bond with two layers of sulfite and a parchment inner liner. This carton, used for berries and round fruit, has a window of transparent material and is equipped with ventilation holes to facilitate precooling and to minimize moisture condensation. The second is a transparent bag of cellulose acetate or cellophane, used for many vegetables. This is stapled rather than heat sealed in order to prevent condensation, because the speedy trip and rapid turnover mean that there is little danger of spoilage before sale. The third is a transparent film with enclosed label used to wrap individual heads of lettuce. For most applications designed to permit visibility without handling, cellulose acetate is preferable to cellophane, due to the fact that it permits transfer of water vapor and thus avoids condensation.

The filled cartons are shipped in a heavy corrugated box, separated into two layers and has a full flap lid which is sealed with gummed tape after precooling. The plastic bags are packed in wirebound crates of sliced veneer which are stronger than sawed lumber

though 50 per cent lighter. Both types of shipping container have been used for lettuce heads.

Fish—Most perishable of all perishable foods is fish. Seafood plays little part in the diet of Middle Westerners because of this fact. Even in the short time taken to fly fish from the coast they may spoil unless measures are taken to keep them cool. Traditional methods of shipping involve use of a wooden box containing ice. The ice and box weigh at least 70 per cent of the fish weight, making this method of packing totally impractical for expensive air transportation.

Air Cargo Research at Wayne University turned its attention to the development of a single-use shipping container which would be inexpensive and easy to handle, would weigh no more than 15 per cent of the gross weight of the shipment, and would provide sufficient insulation to obviate the use of refrigeration or ice. Requirements for the inner package were that it be moistureproof and adaptable to a moistureproof seal, lightweight, strong enough to hold contents, inexpensive, plastic (for a snug fit) and that it not crack at 33 deg. F.

The solution has been the use of an outer and inner container, both of double-faced corrugated fibreboard. In the bottom of the outer container four holes are die-cut and fitted with single-faced strips to carry the load. The outer carton is lined with 8-ply, 25-lb. kraft liner for insulation. Both the outer carton and the insulation can be eliminated if refrigeration is used. Within the second carton is a heat-sealed bag of rubber hydrochloride film. The fish are precooled and the cartons both sealed with tape. In such a package the temperature rise averages only $\frac{1}{2}$ deg. per hour over a 48-hr. period.

Parachute delivery containers

There are indications that the advantages of air delivery will not be limited to big cities, but will be extended to small towns which have no airports and to communities isolated by fire or flood. This will be accomplished by means of parachute delivery, widely used during the war to deliver supplies to advance troops or those cut off from supply line by enemy forces.

If properly packed, almost any article can be safely delivered by parachute. Outstanding illustration of this fact was the providing of blood to fighting lines in metal canisters, placed in corrugated boxes, cushioned and insulated in spun whole glass and packed in a plywood box with a hinged top.

A package especially developed for parachute delivery and adaptable to almost any small item consists of a cylindrical shaped container of tube-rolling waxed and painted chipboard, with a laminated 8-ply waxed chipboard percussion cone at one end to minimize shock of landing and a parachute bucket at the other, the ensemble being held together by vertical lacing. In modification of this container, the parachute bucket and percussion cone are merely laced together with any suitable package fastened on a baseboard and placed



PHOTO, COURTESY ANDRE PAPER BOX CO.

4—Garden-fresh gardenias arrive by air all ready for presentation, affixed to foil-surfaced board.

securely between the bucket and the percussion cone.

There has even developed a free-fall container—consisting of a collapsible, re-usable fibreboard box with air-foil fibreboard wings which rotate the box, retarding its fall. This is said to have the advantages of not catching in trees and of costing less than parachuted containers.

A New York warehouse concern, because of its experience in packing fragile items, is of the opinion that containers used in ordinary commerce can be used equally efficiently for parachute delivery, if sufficient interior protective cushioning is used. To demonstrate this fact, last year the warehouse packed a number of fragile items, including china, bottles of wine, glassware and radios, in fibre drums, wooden boxes, corrugated cartons within a carton, plywood boxes within a box. These they tested first in a 52-ft. free drop down an elevator shaft and later in a series of actual parachute drops.

Drums came through in best condition in all tests. Other containers showed varying degrees of damage, but in all cases tests showed that the most fragile items, properly packed with sufficient shock-absorbing material, can be delivered by parachute in most standard containers—wood, corrugated, plywood, fibre—with almost 100 per cent assurance of arrival in perfect condition.

Future of air cargo

Rapidly expanding use of the aerial route permits the delivery of innumerable rare and perishable items to markets far distant from the regions of origin. Use of correct packaging materials and scientifically engineered containers, designed to meet the problems presented both by special conditions of air travel and by the fragility of the contents, will continue to assure the arrival of such luxury goods in marketable condition.

Packaging and packing for export

by J. D. Malcolmson

Since the packing of each item for export presents its own problem, it is impossible for us to attempt a thorough coverage here. We will, therefore, merely touch on some of the outstanding points and direct the reader to sources of more detailed information. These sources will be found in the bibliography at the end of this article. Particular attention is called to Chapter J of the Bonnell manual which includes 40 pages of very valuable and concise information on this subject.

In considering packing for domestic shipment, the problem is somewhat simplified by the existence of the standard packing requirements itemized in the *Consolidated Freight Classification* which apply uniformly to all of the railroads, many of the coastwise steamship lines and many of the motor carriers. Unfortunately this condition does not exist for trans-oceanic shipments, as not even the efforts of the North Atlantic Conference succeeded in developing uniform packing methods.

Export shipments during normal times

It is a sad but well-known commentary on American industry that we have paid a great deal less attention to export packaging methods than most of our foreign competitors. This is undoubtedly due to the fact that the average American manufacturer had enough domestic business to keep him interested, and his export shipments, if any, were left more or less to chance.

Our chief trouble in the past has been a failure to foresee the much more severe treatment which export packages receive as compared with domestic shipments. This includes loading onto the ship, stowage in the hold, exposure to shifting cargo and damp atmospheres on the voyage, unloading of the ship—in many cases by unskilled labor perhaps with lighters—and, finally, transportation to destination by every conceivable means.

Still another hazard is the amazing ingenuity shown by natives of many foreign countries in pilfering part of the contents without leaving any evidence on the outer container. The U. S. Department of Commerce has suggested that the following points be kept in mind:

1. The nature and value of the article
2. The unloading facilities at destination
3. The inland transportation system in the country of destination
4. The climatic conditions en route and in the country of destination
5. The amount and nature of trans-shipping that may be required en route to the final port
6. The probable pilferage owing either to nature of goods or the country of destination
7. The consular rules and regulations and custom duties of the country of destination
8. Other special conditions determined only through actual knowledge of conditions in the particular country of destination

For example, some countries may assess import tariffs on the gross weight or on the legal weight or on the tare weight. Thus, if the tariff is assessed on the gross weight, it is naturally very important to make the lightest weight container that will carry safely. One of the largest manufacturers of electric refrigerators not long ago reported that one of the South American countries assessed tariffs on the gross weight and these were payable in gold. By changing the outer container from a heavy wooden crate to a sturdy fibreboard container with adequate interior protection, the reduction

1—Heat-sealing bag for exporting precision-machined parts, protects them from grease and moisture.

PHOTO, COURTESY SPECIALTY PACKAGING DIV., MARATHON CORP.



2—War lesson, civilian use—radio packed according to Method II, in moistureproof film with desiccant.

PHOTO, COURTESY DAVISON CHEMICAL CORP.





3—Spray-processed milk powder, which has the virtues of being space-saving and long-lasting, is exported in strong wooden barrels. The containers are protective not only during shipment, but also during storage.

PHOTO, COURTESY THE ASSOCIATED COOPERAGE INDUSTRIES OF AMERICA, INC.

in gross weight effected a saving of $10 per refrigerator in custom duties. It should also be borne in mind that ocean-freight rates are calculated not only on the weight but also on the cubic space occupied, so that it is very important to knock down merchandise to the greatest possible extent.

The proper marking of export packages does not sound complicated, but many shippers fall down on this point, more through ignorance than carelessness. Your insurance company, or even the American Consular representative, can usually offer good advice, and on page 234 of *Bonnell's Manual* there is a table showing most of the common caution markings such as "This Side Up" translated into Spanish, French, German and Portuguese. Many foreign countries also require the gross, tare and net weights to be shown in metric figures. A valuable booklet in this connection is the *Units of Customary and Metric Measure* issued by the Department of Commerce as Publication No. M 121.

Export shipments during the war

War times always accelerate technological developments and shipping methods are no exception. During World War I the Forest Products Laboratory at Madison, Wisconsin, made almost unbelievable savings possible in cargo space and tare weights in the overseas shipment of artillery wheels and nearly every other commodity required by the Ordnance Department. Naturally much of this development endured through application to peacetime shipments, and of course the 20 years between wars were also marked by improvements in export packaging. It is quite evident, however, that we still have a long way to go before we reach the ultimate in such developments, and World War II certainly helped to accelerate our knowledge of shipping methods. As a matter of fact, the probems in this war were probably 100 times greater than in the past war due to the fact that it was necessary to ship equipment all over the world, using every form of transportation including a great deal of shipment in cargo planes.

For example, certain Army clothing which was formerly packed in fibre and wooden cases was compression-baled with a space saving of 35 per cent. Shovels which were formerly shipped in wooden crates were simply strapped together with wire, saving 20 per cent in space. A field range stove for the Army which was formerly shipped in a double crate was subsequently shipped in a newly designed single crate saving seven per cent in space. Army garbage cans formerly shipped separately in individual crates were nested together in a lighter crate adequate for six cans with a space saving of 60 per cent. Army shoes which were formerly packed in individual cartons were bulk packed with a saving of 25 per cent. Machine guns formerly

4—Operators band 12 heavy boxes on a pallet into a single unit, for easier handling and shipping.

PHOTO, COURTESY AMCE STEEL CO.





PHOTO, COURTESY GERRARD STEEL STRAPPING CO.

5—Perishable foods, such as oleomargarine, may be exported, packed in steel-strapped fibre cartons.

shipped one to a box are now shipped two to a box with a space saving of 35 per cent. This list could be extended indefinitely but it simply illustrates the urgent need of conserving every possible cubic inch of cargo space in order to offset the delays due to shipping all over the world.

Technical developments during World War II were, of course, much more highly developed than in 1917–18. Thus, the Forest Products Laboratory enormously increased its staff of packaging engineers and in addition operated a five-day course to train shipping men, and it is expected that the course will continue to run indefinitely. The Containers Branch of WPB also added to its specialists in packaging, and the War Department stationed packaging experts at unloading points all over the world. These special military units were known as port battalions.

6—Packed in large sacks, the first postwar shipment of coconut from the Philippines is unloaded at dock.

PHOTO, COURTESY FRANKLIN BAKER DIV., GENERAL FOODS CORP.



The crying need during wartime was to deliver merchandise in undamaged condition and at the same time to conserve every possible pound of weight and cubic inch of cargo space. For example, millions of cases of canned goods were shipped to England on Lend-Lease and to the American Army abroad in "weatherproof" solid fibre boxes. These special boxes were able to withstand weeks of total immersion in water without disintegration and simultaneously furnished very large savings in weight and cargo space. Cargo space was further conserved by filling in all remaining spaces in the hold with cases of canned goods or similar small packages. Trucks were seldom loaded onto a ship empty as the truck body itself was used to carry merchandise. The same idea of space economy can be extended almost indefinitely.

Another point that should be kept in mind by all exporters is the fact that modern machinery and military equipment was made to far closer tolerances than they were in the last war. Thus, an unbelievable number of items, such as airplane engine parts, were made to tolerances of 0.0001 inch. This means that the slightest amount of rusting of such a part rendered it worthless. One of our military observers reported that he had seen a tragic sight in Egypt—a large delivery of American airplane engines and parts which had rusted in such a way that they were worthless, though most of us would not have considered the amount of rust as serious. Telephone switchboards and other delicate and strategic equipment were also shipping casualties. Shippers of such items accordingly developed many methods of foolproof protection.

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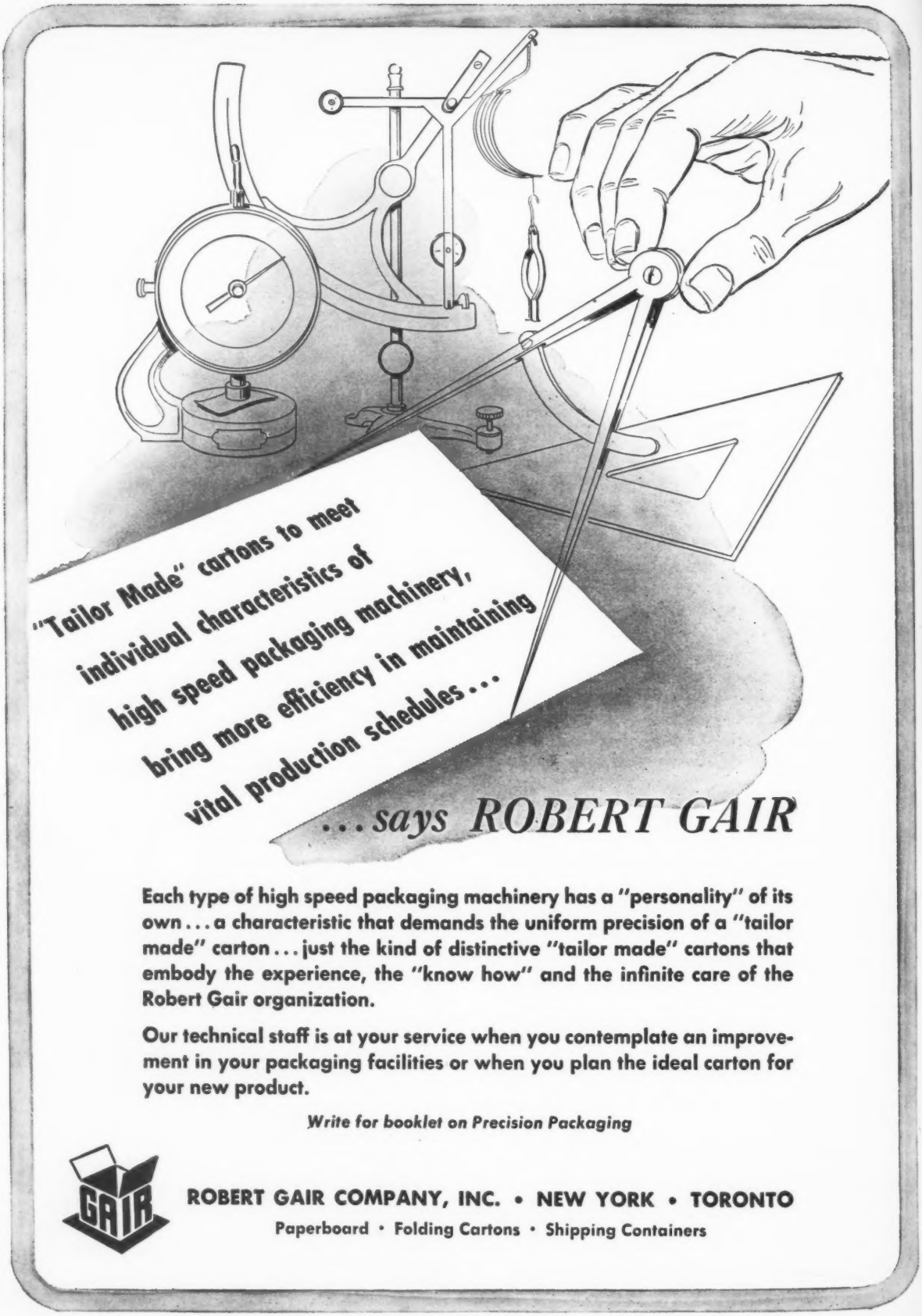
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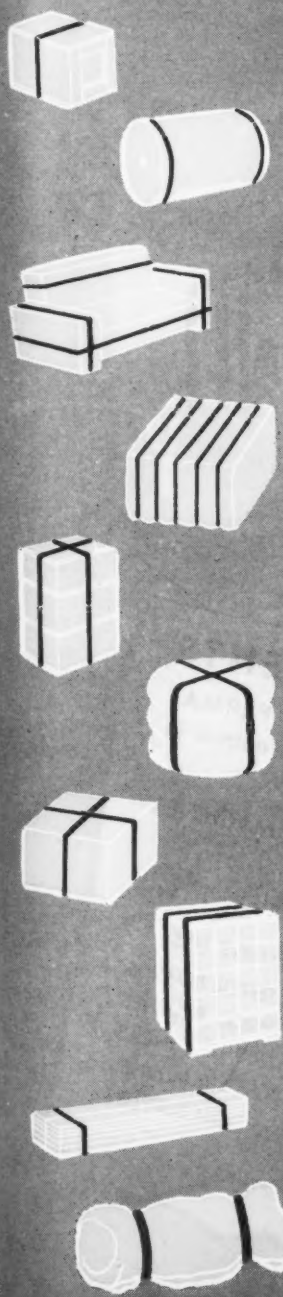
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meets all federal strapping specifications, provides effective, economical protection against shipping hazards and pilferage, reduces shipping costs, speeds material handling, and assures safe delivery.

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Acme Steelstrap is used by every shipper of manufactured or processed products including food, furniture, chemicals, steel and steel products, heavy goods, lumber, paper, textiles, leather, machinery, farm equipment, radios and musical instruments, electrical appliances, building materials, and plastics.

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The Steelstrapper (shown here) is the fastest seal-fed strapping tool yet developed. With a single stroke of each lever, this tool tensions, seals and snips the strapping. Its use permits speedy, low-cost one-man operation on all types of containers, crates, bundles, skids and pallets.

Acme has developed a complete line of tools to handle every type of strapping job. The tool best suited to your needs is determined by your product and shipping conditions.

RIGHT STRAP FOR EVERY JOB

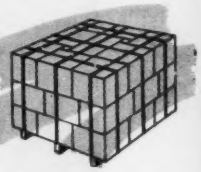
Acme offers a full range of strap widths and weights for reinforcing cartons, wooden boxes, crates, bundles, rolls and bales. For convenience, mail or phone your next order for Steelstrap in 100 lb. units to one of the Acme offices listed below, using the following table as a guide.

Width Thickness	Ft. Per 100 Lb.*	Width Thickness	Ft. Per 100 Lb.*
⅜" x .015"	5236	¾" x .020"	1963
½" x .015"	3926	¾" x .023"	1707
½" x .020"	2945	¾" x .035"	1125
⅝" x .015"	3141	1¼" x .035"	673
⅝" x .020"	2356	1¼" x .050"	472
¾" x .015"	2618	2" x .050"	294

*approximate

ACME UNI-PAK METHODS

For quick, easy handling of shipments of small units, no system equals Acme's Uni-Pak method. Pioneers in the field of "in-one-unit" shipping, Acme Steelstrap made possible skid loads, bundles and bales, and later pallets. Uni-Pak methods reduce labor costs, save time, permit quicker, easier stowage, prevent loss and pilferage, and allow the use of lift trucks in warehouses, on docks and in inter-plant travel. With a wealth of experience to guide them, Acme Engineers will be glad to demonstrate how you can handle your product more economically.



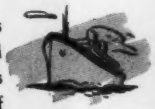
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Speed up loading and unloading operations (turn-around time) . . . pay for less freight weight . . . reduce freight claims for customers and protect goodwill—save labor costs. You can do all this with the Acme Unit-Load Process.



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146 Summer St.
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712 Book Tower
Phone: Cadillac 6190

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NEW ORLEANS 12
309 Magazine St.
Phone: Magnolia 5659

NEW YORK 17
103 Park Avenue
Phone: Ashland 4-6470

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Phone: Lombard 3862

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Phone: Elliott 7554

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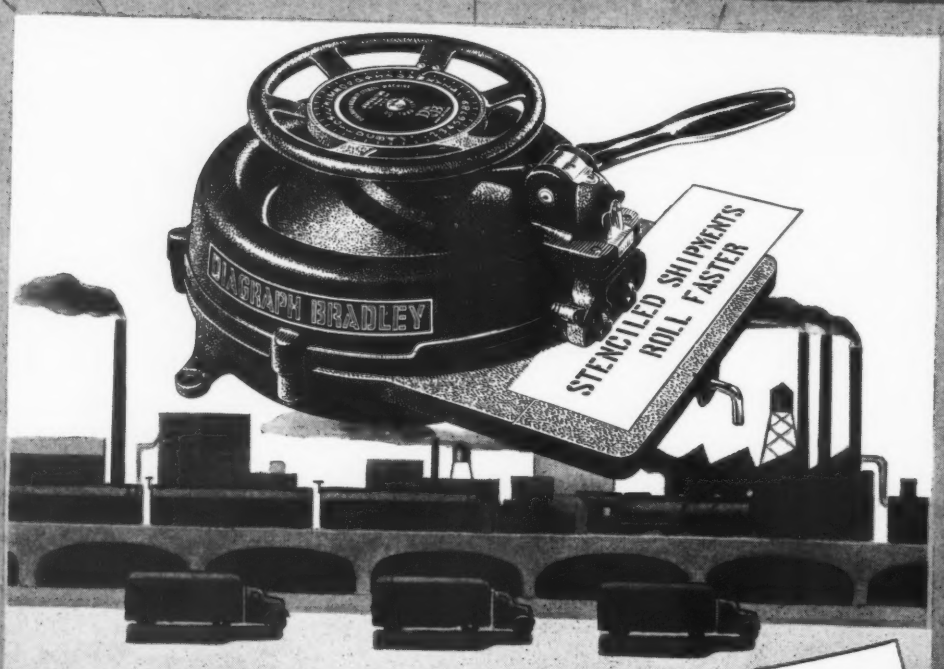
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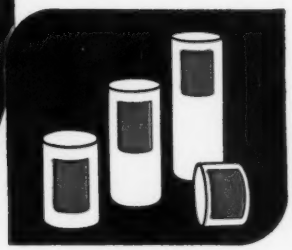
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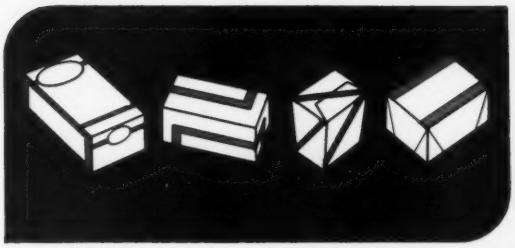
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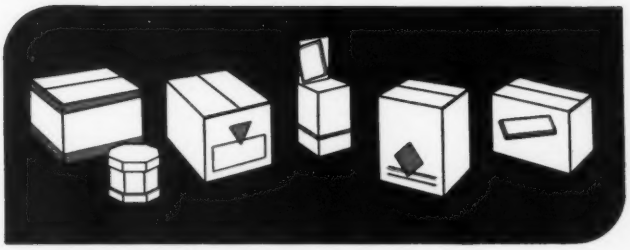
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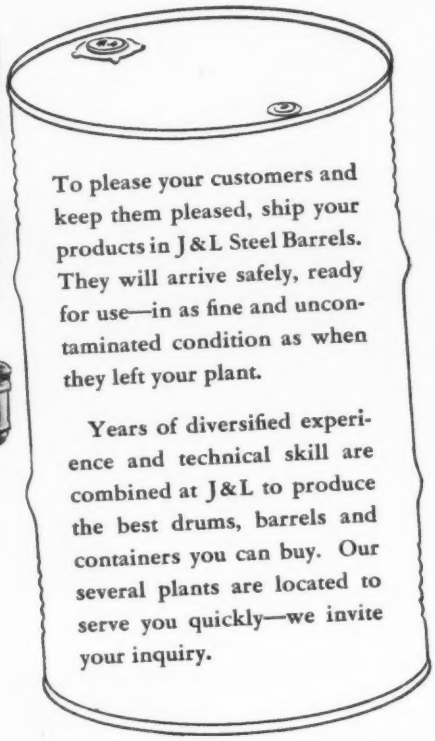


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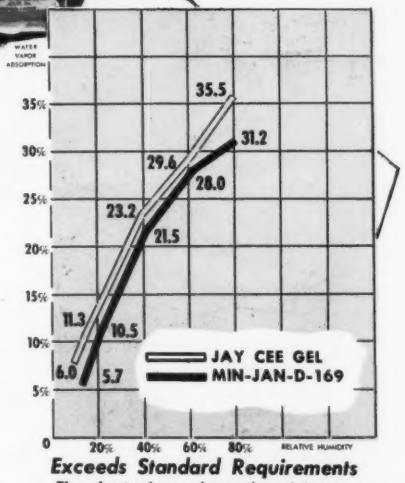
J&L STEEL



Packaging Engineers, your products can be seriously damaged by rust, corrosion, or mildew—because of "in-the-package" moisture. Avoid such damage. Include Jay Cee Silica Gel in the packages with your product. It is a product of laboratory control that exceeds the minimum requirements of joint Army-Navy specification JAN-D-169 (see chart).

Jay Cee Silica Gel has amazing power to adsorb moisture, and is chemically inert under all conditions since adsorption is a physical process. When it is completely spent, it is still as hard and dry appearing as in its completely activated state. One cubic inch of silica gel may contain as much as 7½ million square inches of actual surface within and on the surface of the particles . . . all capable of holding moisture.

The illustration shows Mr. Otto Mueller, packaging foreman, inspecting one of his Ampro Sound-On-Film Projectors sealed tightly within a representative moisture vapor-proof barrier, ready to be placed in a shipping carton. Packed within the barrier, with the Projector, are three small bags of Jay Cee Silica Gel . . . which adsorb "in-the-package" moisture and prevent damage from rust or corrosion.



Exceeds Standard Requirements

The chart above shows the minimum requirements at each humidity level under joint Army-Navy Specification JAN-D-169 in the lower curve and an average of several hundred tests on JAY CEE Gel in the upper curve. This is your assurance of the adequate performance of Jay Cee Silica Gel.

JAY CEE SILICA GEL

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128 INDUSTRY AVENUE
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Behind the Scenes See how the

H & D package laboratory operates "behind the scenes." A typical product, never before packaged in corrugated, enters the laboratory. How H & D Package Engineers proceed with the design, development and testing of an engineered corrugated shipping box is photographically recorded, scene by scene. If you're interested in packaging, you'll want to see this detailed backstage presentation of the H & D package laboratory at work.



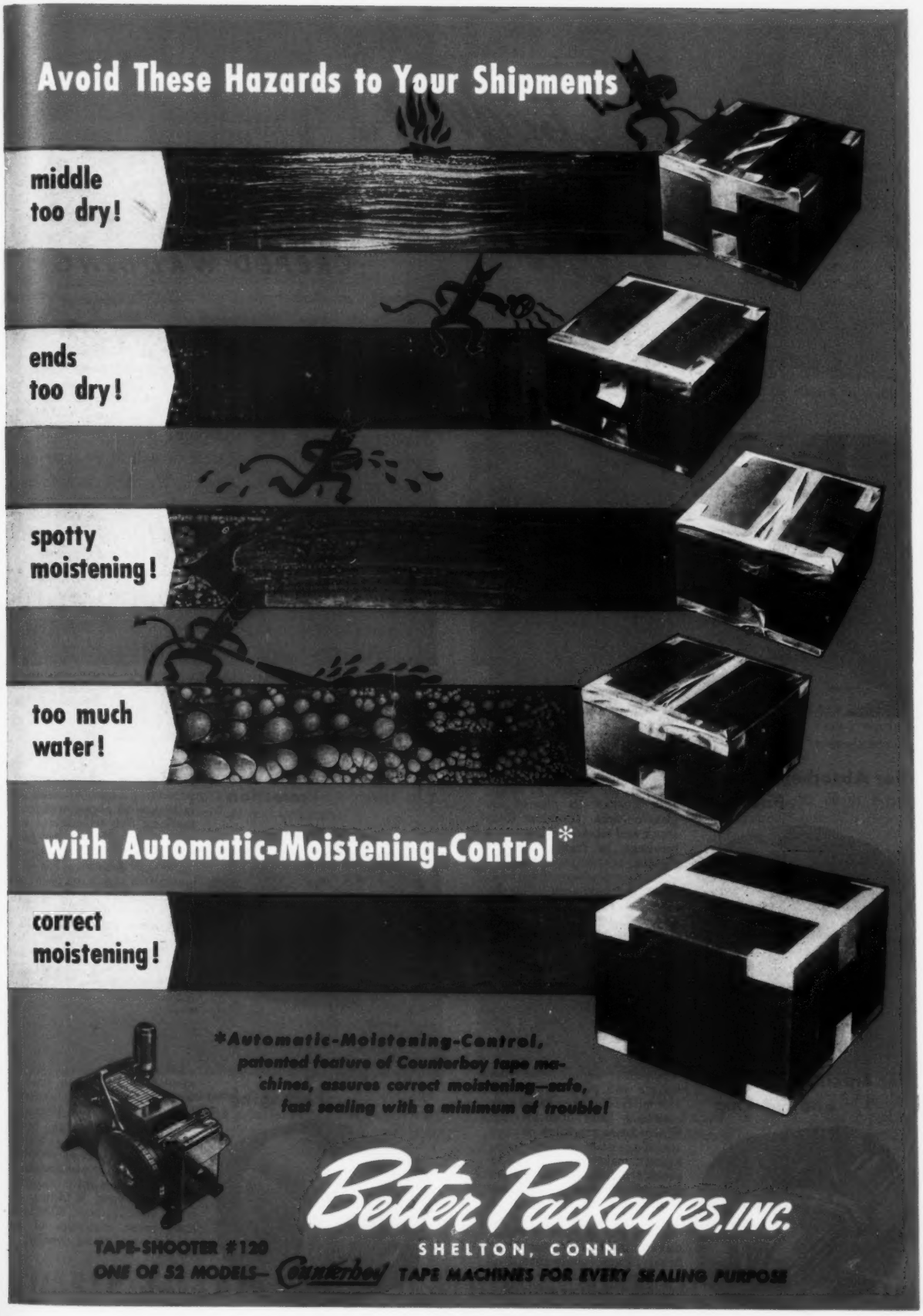
TAKE A LOOK AT PACKAGING IN ACTION

• Look at packaging from "behind the scenes." Go along with a Package Engineer while he designs an engineered shipping box. To get a better understanding of the science of package engineering, send for your copy of H & D's book, "Behind the Scenes at the H & D Package Laboratory." Write today.

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spotty moistening!
too much water!
with Automatic-Moistening-Control*
correct moistening!
*Automatic-Moistening-Control, patented feature of Counterboy tape machines, assures correct moistening—safe, fast sealing with a minimum of trouble!
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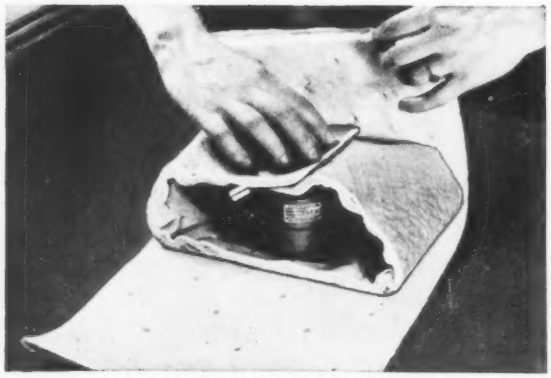
Float Packaging with...

Kimpak

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CREPED WADDING

A PRODUCT OF Kimberly Clark RESEARCH



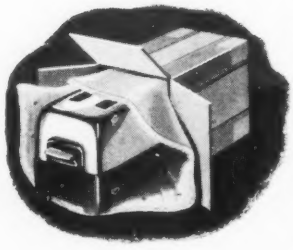
Whatever you ask of a cushioning material, one of the many specialized forms of KIMPAK will fit your requirement perfectly. KIMPAK Creped Wadding is soft as a comforter, resilient as a rug, grit-free, muss-free and attractive looking. It saves time and cost in shipping rooms. Workmen like it. It made an astounding record in the late war for safeguarding precious shipments under the roughest transport conditions. Here are a few of the forms of KIMPAK and some of the things they do . . . and there's an experienced KIMPAK man ready to help you select the exact specification to do your job most effectively at lowest cost.

For Absorbent Packing



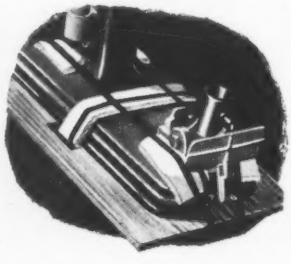
—Liquids and easily liquefiable products are packed in absorbent KIMPAK to protect the glass or other container from shock and vibration. In case of breakage, or leakage at the closure, contents are quickly and thoroughly absorbed. KIMPAK can be used to fill the voids between wrapped objects, too, without the attendant muss or annoying splinters found in other types of loose fill packing. No other material provides comparable protection with less bulk or shipping weight.

For Surface Protection



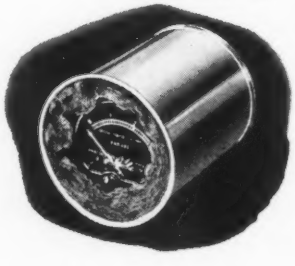
—Because KIMPAK is so soft and clean, it is unsurpassed for protecting highly finished surfaces against abrasion or pressmarking due to contact with crate members or other packaging materials. Some KIMPAK types are neutral — for safeguarding sensitive products from damage by chemically-active substances. And KIMPAK is an attractive material which gives fine merchandise a "jewel box" setting. KIMPAK is the interior packaging material which makes your package as modern as your product.

For Bracing and Blocking



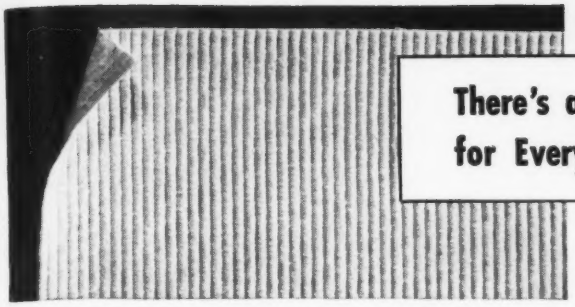
—KIMPAK supplements the surface and cushioning characteristics of other packaging materials used for bracing. Where heavy machines or parts are held in place by steel straps, KIMPAK makes an ideal pad to protect painted or enamelled surfaces. It safeguards the salability of home appliances or fine furniture by covering all interior case members which might touch and mar their beauty. From luxury merchandise to precision-finished parts, products ship more safely protected by KIMPAK.

For Flotation Packaging

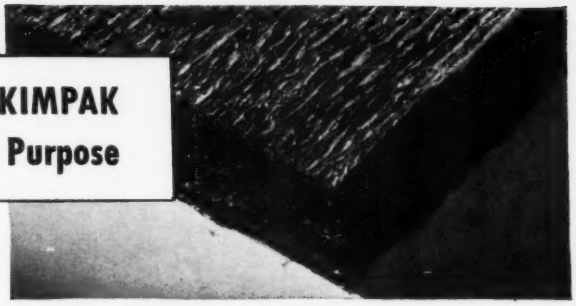


—In a compact, resilient wrap, KIMPAK *suspends* your product within the shipping package. It absorbs shock and vibration. And in packing large, heavy objects, KIMPAK acts as a float cushion. It serves as an overwrap, too, where one container is shipped within another. KIMPAK Creped Wadding absorbs shocks more effectively than most materials of far greater weight and density.

*KIMPAK (trade-mark) means Kimberly-Clark Creped Wadding



There's a KIMPAK for Every Purpose



"Whipcord" Embossed Type 4—Used for protective wrapping of products with delicate surfaces such as plastics, china, silverware and jewelry. Also as slip-sheets between high-finish flat sheets of plastic or metal in shipment, for plate pads, as wrapping for candles, soap and cosmetics, and for wiping and polishing purposes.

"Whipcord" Embossed Type 4 is available in sheets 2″ to 40″ wide and rolls of 2″ to 40″ widths; in thicknesses of .01″, .015″ and .02″. Various backing papers.

Plain Type 500 (Unembossed, Unbacked)—For cushioning of odd-shaped articles such as delicate instruments or assemblies, for loose-fill and bulk stuffing in shipping container. Water-resistant character makes this especially suitable for export shipment.

Plain (Unembossed, Unbacked)—Type 500; water resistant KIMPAK; is available in sheets and rolls; rolls in widths ranging from 3″ to 80″, sheets in widths 2″ to 40″. It comes in thicknesses of .02″ to 1.25″.



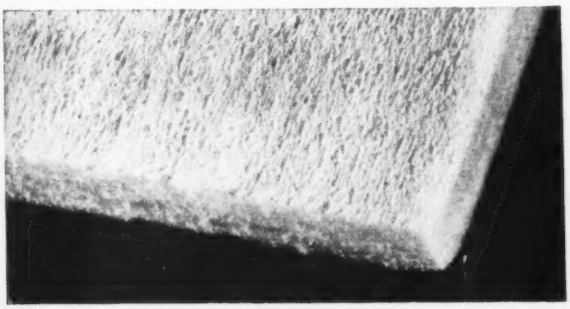
Punch Embossed Type 201—Developed for shock absorption and protection of fine finishes for domestic shipments. This type of KIMPAK supplies a thick, resilient cushion with high moisture absorption. Meets government postal regulations for shipment of liquids.

Available in sheets 2″ to 48″ wide, and rolls of 2″ and 48″ widths; .14″ to .70″ thicknesses. Backed with a choice of 7 different papers to meet individual requirements.



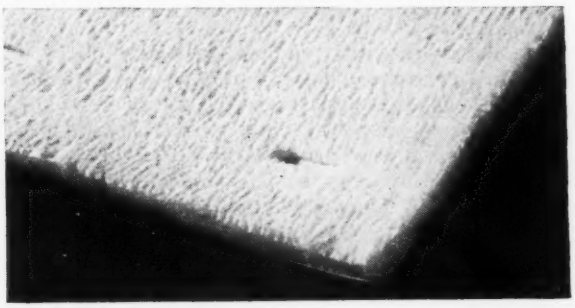
"Dimple" Embossed Type 500—A thick, protective pad, especially adaptable to export packing where severe moisture conditions are anticipated. For all packing of heavy equipment, machinery parts, etc. So highly resistant to moisture, it will float indefinitely on water.

In sheets and rolls 3″ to 48″ wide; in thicknesses of from .27″ to .50″. It is available backed with 20, 40, 60 lb. Kraft paper, and with 20-60-20 waterproof Creped-Kraft.



Plain Type 201 (Unembossed, Unbacked)—For cushioning of fragile articles and delicate surfaces or where an absorbent packing is required. White, clean, soft—absorbs more than 16 times its own weight in water.

Available in sheets and rolls: Rolls in widths ranging from 3″ to 72″. Sheets in dimensions of 3″ to 48″ in width. It comes in thicknesses of from .01″ to .45″.



"K" Embossed Type 201—Designed principally for protection of fragile and delicate finishes of wood, glass, metal or plastics. It also provides cushioning qualities to other packaging materials.

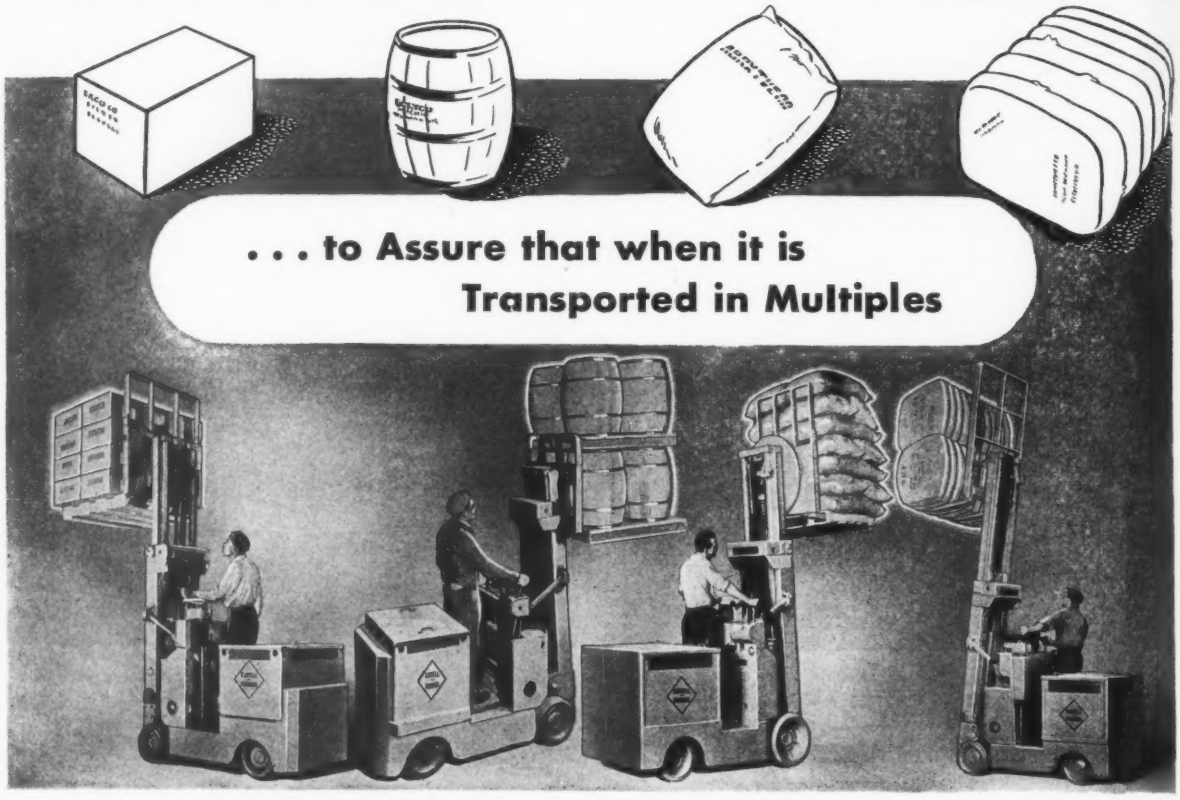
Available in sheets or rolls: Sheets 3″ to 60″ wide. Rolls 4″ to 72″ wide. Thicknesses from .05″ to .10″. Various backing papers.

These are only a few of many forms of KIMPAK

KIMBERLY-CLARK CORPORATION · NEENAH, WISCONSIN

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whether in the form of a Box..or a Barrel..or a Bag..or a Bale



. . . the User May Realize Lowest Costs in His Own Manufacturing and Distribution

Look beyond that new, modern container in your hand or on the drawing board. Because your customer's profitable use of it may depend upon his ability to handle and transport it in dozens or *hundreds* at a time—with economies that customers can share, too.

And send for the Elwell-Parker Materials-Handling Consultant to explain and demonstrate how Industrial Logistics influences the capacity and proportioning of new, modern containers—insuring their low-cost handling throughout Warehousing and Distribution in Master Unit Loads, on Pallets or Skids, by Elwell-Parker Systems of Electric Trucks, Tractors and Cranes.

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The Elwell-Parker Electric Company, 4523 St. Clair Avenue, Cleveland 14, Ohio.

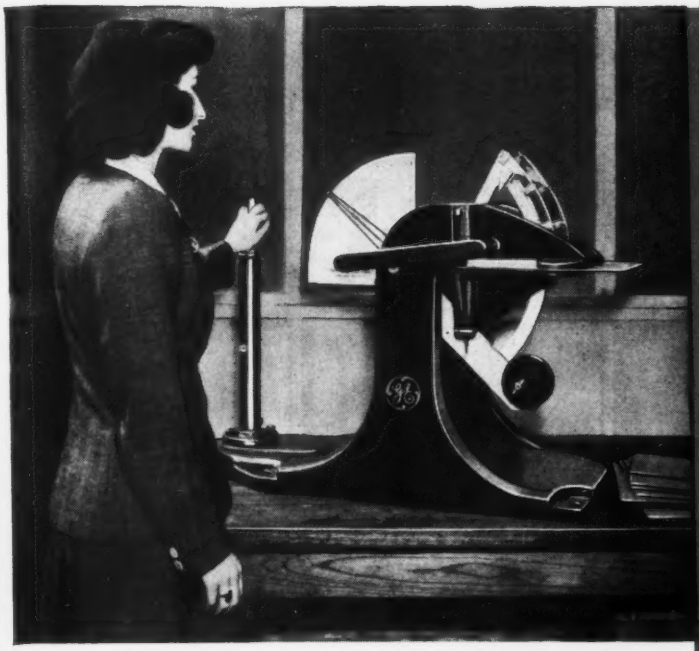
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Philadelphia	RIT 7246
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York, Pa.	4-5430

ELWELL-PARKER

POWER INDUSTRIAL TRUCKS

Established 1893



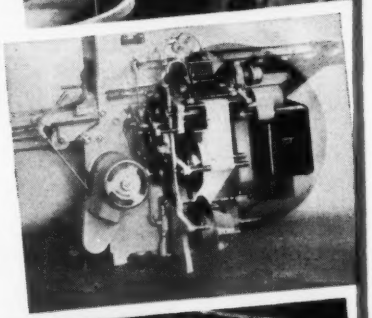
How to Make SURE *your* Shipping Container "can take it"

3 HELPFUL DEVICES...

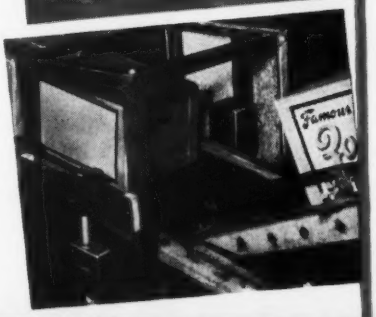
for the improvement of package design and manufacture



● THE G-E ZAHN VISCOSIMETER ... a simple, durable device to measure the viscosity of liquids such as printing ink, paint, varnish, and lacquer. It permits control of the viscosity of finishing materials to obtain uniform results. No special skill is required for operation. (Write for Bulletin GEA-3618A)



● CUT-OFF REGISTER CONTROL ... for use on most moving-web machines. This electronic control makes possible accurate register so that the material will be cut at the proper point in relation to designs, trade-marks, and other printing on the web. Helps to improve appearance, and to reduce costs in both material and labor. (Bulletin GEA-4371 gives further information)



● PHOTOELECTRIC RELAYS ... have a great variety of uses in the industrial field. The picture at right shows a G-E photoelectric relay counting packages passing on a conveyor. Other uses include the sorting of packages having different heights, and automatically routing them to the proper conveyors. Photoelectric relays are accurate, easy to apply, and easy to maintain. (See Bulletin GEA-1755F)

● Your product deserves adequate protection while it is in transit. Here's a handy testing device that provides an accurate measure of the resistance of shipping containers to both puncture and bending.

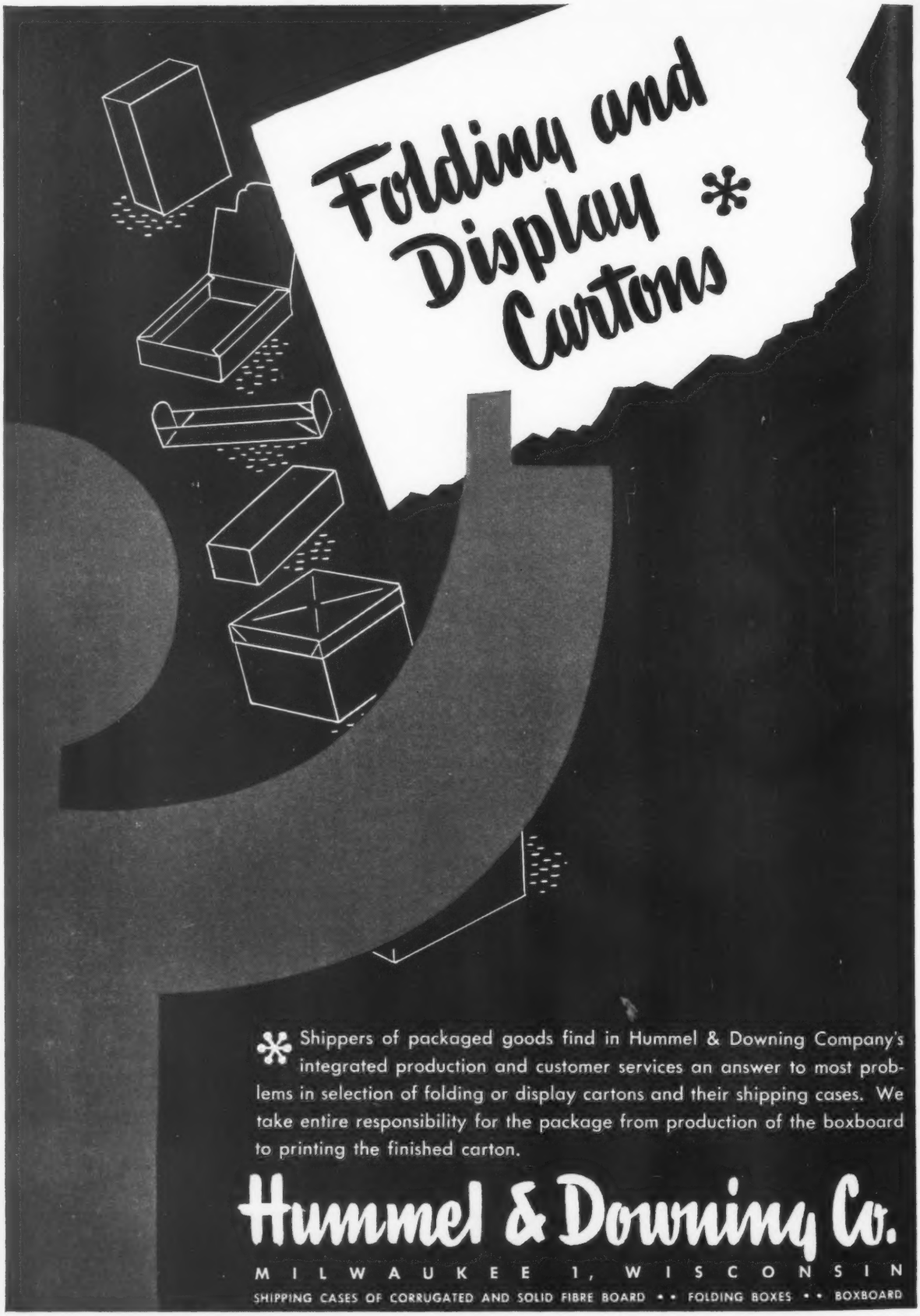
It's the G-E puncture tester—for testing a wide range of materials. Corrugated board, fibreboard, wallboard, thin plywood, heavy paper or liner, and vulcanized fibre can all be measured for strength.

This is a simple, easy-to-operate device: a pointed pendulum swings from a fixed position to puncture a test sample. The measurement, which is the amount of energy required to puncture the sample, is indicated on a clearly marked scale. For full details, send for Bulletin GEA-4168.

Our nearest office will be glad to supply you with further information on this and other G.E. testing equipment. Apparatus Department, *General Electric Co., Schenectady 5, N. Y.*

MAKE G.E. YOUR TESTING EQUIPMENT HEADQUARTERS

GENERAL ELECTRIC



* Shippers of packaged goods find in Hummel & Downing Company's integrated production and customer services an answer to most problems in selection of folding or display cartons and their shipping cases. We take entire responsibility for the package from production of the boxboard to printing the finished carton.

Hummel & Downing Co.

MILWAUKEE 1, WISCONSIN

SHIPPING CASES OF CORRUGATED AND SOLID FIBRE BOARD • • FOLDING BOXES • • BOXBOARD

MODERN

MARKING

COLORS

& METHODS

☆

Floquil
REG. U.S. PAT. OFF.

☆

QUICKER • CLEANER

MORE ECONOMICAL

☆

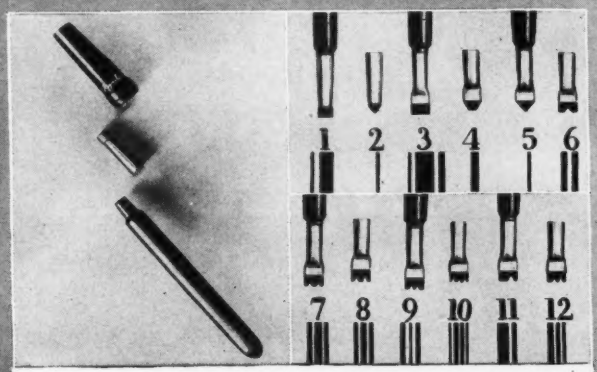
A Stroke and It's Dry

FLOQUIL PRODUCTS, Inc.

FOR FREE-HAND MARKING



Floquil Fountain Marker and Floquil Transparent Marking Colors for free-hand lettering and marking on any surface, wet or dry. Floquil exclusive features: Handy, non-breakable, non-inflammable. Only 3 non-moving parts. No threads or valves to clog or strip. 12 different style precision fitted nibs instantly interchangeable by hand. Unconditionally guaranteed for mechanical perfection.



Floquil Fountain Marker has only 3 non-moving parts. Nothing can get out of order. No valves or threads to clog or strip.

12 different style nibs make Floquil Fountain Marker extremely versatile. Precision fitted, nibs are instantly interchangeable by hand. No tools required.

FOR STENCILING



Floquil Transparent and U. S. Gov't. Approved Opaque Marking Colors provide neater, clearer, faster-drying marking in a fraction of the usual time. New, exclusive roller marking method originated by Floquil, eliminates wear and tear on stencil. Speeds operation. For use with all stencil boards up to .010" thick.

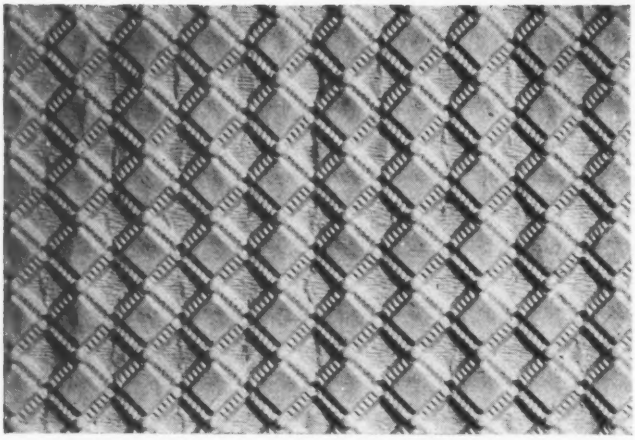
1993 BROADWAY • NEW YORK 23, N. Y.

XUM

SAFEGUARD Your Product by Wrapping In One of the Sweetone Protective Papers--
DECOPAD ☆ PADSIT ☆ FLOSSINE ☆ PADOCEL

PADOCEL





PADSIT

Today, more than ever before, it is essential that your product reach the market in perfect condition. To do this, under today's difficulties of shipping and storage, you must give it the utmost in protection.

Sweetone protective papers will do this for you. There is a special one for your purpose, and if you will tell us your problem we will be glad to send samples.

SWEETONE PAPER PRODUCTS

GEORGE H. SWEETNAM, INC.
Specialists in the Packaging Field
282-288 PORTLAND ST. CAMBRIDGE, MASS.



Bareco's refinery at Barnsdall, Okla.

has ALWAYS Been our Business!

The manufacture of famous Be Square Waxes was no war-time expedient at Bareco! For many, many years before the war, the production of fine, pure Be Square Microcrystalline Wax and other types of waxes played a major part at Bareco's great refinery at Barnsdall, Oklahoma. For over a decade, Bareco scientists and research chemists — backed by the "know-how" gained from long experience in refining and manufacturing the very best in petroleum products — *have been the pioneers of many of the outstanding developments in microcrystalline wax manufacture,* exercising strict laboratory control to assure constant quality and uniformity in all Be Square Waxes.

BE SQUARE MICROCRYSTALLINE WAX FOR PACKAGING

Even before World War II, Be Square Microcrystalline Wax had proved its exceptional value to America's great Packaging Industry. With the extra demands of war-time for highly specialized and seemingly impossible advances in packaging techniques, the unusual properties of Be Square Microcrystalline Waxes were found to be the answer to many perplexing packaging problems.

Affording a highly efficient moisture-vapor barrier with high melting points (170/175° F. and 190/195° F.) and excellent heat-sealing properties, these fine Be Square Waxes are odorless, tasteless and chemically inert. They have demonstrated exceptional worth in the protective packaging of frozen, dehydrated and other types of foods, medical supplies, export shipments and tobaccos — just to mention a few of the applications of Be Square Waxes.

Peacetime America will demand of the packaging industry even greater technological advances — and Be Square is prepared to help solve the problems of peacetime packaging as it did in war-time.

Samples of these waxes are available in black, white and amber.

BARECO OIL COMPANY

BOX 2009
TULSA, OKLAHOMA

WIDENER BLDG.
PHILADELPHIA, PA.

XUM

Davison Packaging Service



INNER PROTECTION

(Dehydrated Packaging) against Mildew, Mold, Rust, Corrosion

Davison offers a complete packaging service to meet each individual problem. Previous strict specifications can be adapted to your product—retaining full protection and adding sales appeal. This is a practical, economical and efficient way to assure the ultimate consumer's receiving what you planned and made for him—factory fresh and ready for immediate use. *This consulting service*—staffed by experts—*can be added to your organization at no additional cost to you.*

Moisture damage is always a threat to goods in transit and storage*. Davison engineers can show you how to banish this hazard by eliminating the cause. The use of old and inefficient methods in attempting to combat rust, corrosion, mildew and mold can defeat the best efforts of design and manufacture. In the field of competition, present your product to the ultimate consumer in perfect condition and adjustment.

Davison Dehydrated Packaging, using PROTEK-SORB** silica gel, banishes this ever-present danger of moisture damage by reducing and holding the relative humidity *within* the package to well below 30%. When Davison specifications are followed, your product will be protected regardless of temperature changes and excessive humidity conditions to which the package may be subjected.

Your customers will receive your product in factory-fresh, clean condition, ready for immediate use. Adjustments will not be disturbed . . . no grease will have to be removed.

*Ordinary Air carries moisture—water vapor. As long as the relative humidity remains below 30%, no moisture damage results. The average relative humidity in practically every industrial section of the U. S. is well above 30%.



Dehydrated Packa... the moisture-vapor ... silica gel as the ... or similar material ... damage caused by ...



...d Packaging using Pliofilm or Saran ... flexible moisture-vapor barrier. ...K-SORB silica gel used as the ... packed in this manner have ... over the world and have ...tinations in perfect condi... use.



Dehydrated Packaging using "Use-and-R... metal containers as the moisture-vapor b... rier and PROTEK-SORB silica gel as th... desiccant. Barriers of this type provide per-fect storage containers and permit customers to use same container to return parts or assemblies for reconditioning.



Dehydrated Pack... the moisture-vapor b... silica gel as the desiccan...



. . . a service that assures "ready-to-use" delivery

. . . a service that will guard your reputation

. . . a service that secures customer good will for you

OUTER PROTECTION

(Waterproofing and Vaporproofing corrugated or fibreboard cartons or hot dipcoating over aluminum foil with Davison Asphalt Products.)

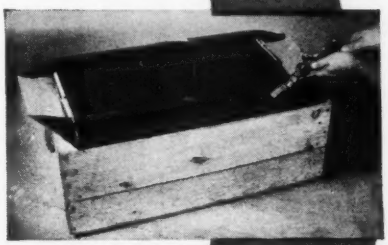
These economical Davison Asphalt Products surpass U. S. Government Specifications which applied to shipping of war materials and are being used by domestic and export shippers today. Their application to your products will be a major step in creating greater acceptance for your products, holding customer good will and *in saving time on* your packaging operation.



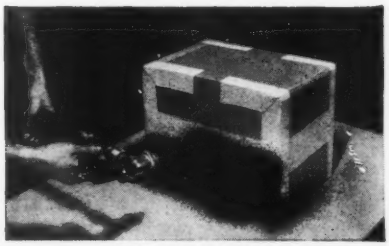
PROTEK-F[illegible]† asphalt compound is a quick-setting asphalt hot dipcoating compound for moisture-proofing packages and the sealing of cork insulation and containers. Passes all tests in JAN-P-115, using dipping temperature of 280°-300° F. Has a high softening point and is economical to use.

Davison Packaging Service offers custom-designed protection for YOUR specific product. We can show YOUR packaging engineers how to adapt any specification to modern economical practice . . . retaining safety and adding merchandising and sales appeal.

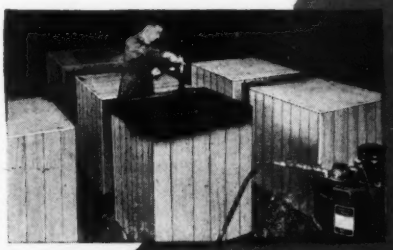
Write to the Manager of Davison Field Engineers without obligation for information and direction.



PROTEK-SEAL† asphalt compound forms moisture and waterproof seals on [illegible] types of waterproof paper—including creped and crinkled paper used as case liners.



PROTEK-COAT† asphalt compound . . . a Davison development . . . provides a Type II moisture-vapor-proof barrier which meets the requirements of Joint Army-Navy Specification JAN-P-131 for Class C Container Overwrap, when sprayed as recommended and overwrapped with kraft paper. Conforms also with U. S. Ordnance, Signal Corps and Chemical Warfare Service Requirements for Method 1-A Packaging.



Davison Crate-[illegible] coating . . . sprayed at moderate temperature [illegible] waterproofs the bare or fully sheathed crate. Its resiliency permits it to expand—bridge—[illegible] to form a waterproof roof. Will stand [illegible] temperature variations.

THE DAVISON CHEMICAL CORPORATION

Progress through Chemistry

BALTIMORE-3, MD.

BAKELITE

TRADE-MARK

Mark *of* Quality

Wherever plastics are known and used, the trade-mark "Bakelite" is a mark of quality, performance and progress.

Bakelite Corporation, a Unit of Union Carbide and Carbon Corporation, is a pioneer in the field of plastics. Leo H. Baekeland, who discovered the first synthetic *thermosetting* plastics, founded this leader in the plastics industry. Today, Bakelite Corporation is noted not only for thermosetting plastics — phenolics and ureas — but also for thermoplastics — vinyls, polystyrenes, and polyethylene.

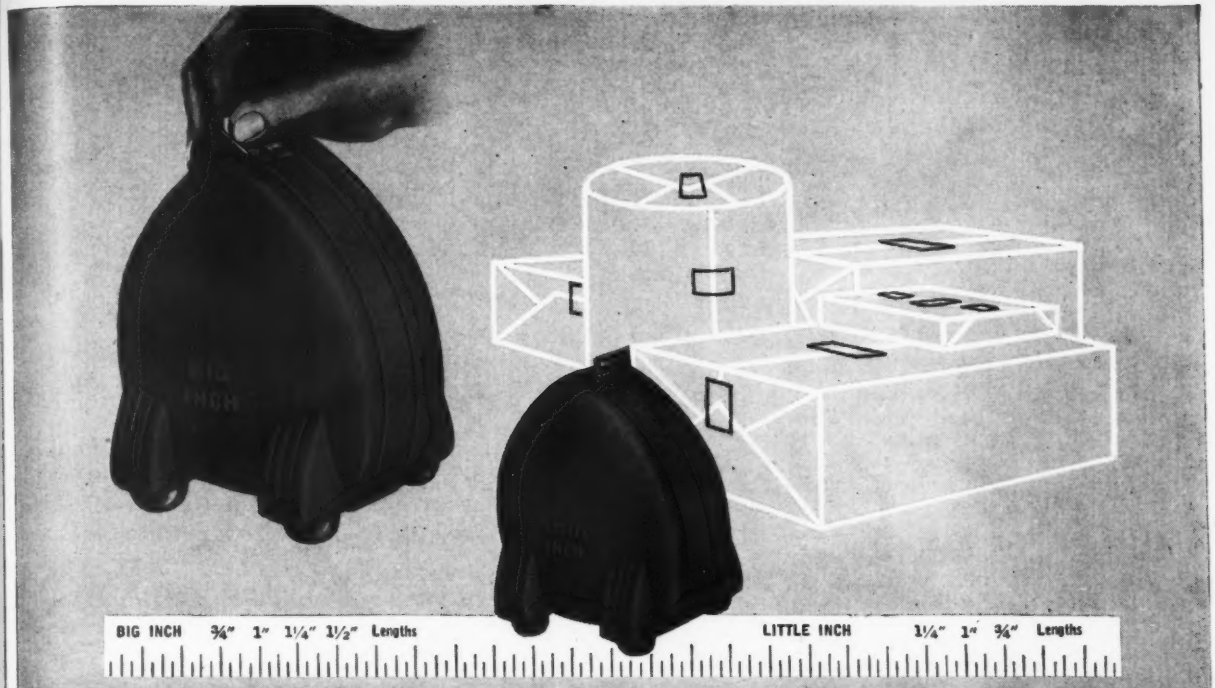
Bakelite's life has been marked by a steady growth based upon many outstanding accomplishments in the development of plastics materials and processing techniques.

Bakelite Corporation has made known its achievements via the pages of MODERN PLASTICS through more than 20 years of uninterrupted advertising.

MODERN PLASTICS MAGAZINE MEMBER AUDIT BUREAU OF CIRCULATIONS

... the only ABC plastics paper ... the field's established institution ... one of America's great industrial publications

PUBLISHED BY MODERN PLASTICS, INC.
122 EAST 42nd STREET, NEW YORK 17, N. Y.
Chicago • Washington • Cleveland • Los Angeles



at last . . . MEASURING dispensers for PRESSURE-SENSITIVE TAPES

The new BIG INCH and LITTLE INCH dispensers offer the fastest, most economical method of applying tacky tapes—

MEASURES SHORT STRIPS—No waste! Measures and dispenses short lengths by simple adjustment. Less than half the tape ordinarily used provides secure sealing.

PROTECTS TAPE! Opens like book for loading tape securely inside. Every bit of tape is utilized.

SPEEDS PACKAGING! New style pickup leaves strip poised on fingertip, convenient for fast application (see illustration 3).

SAVES SPACE! Tape is dispensed upward. Less counter space needed. Weight prevents awkward sliding.

BIG INCH *takes 3" core rolls up to widths of 1", lengths of 2,592". Adjusts for ¾", 1", 1¼", 1½" lengths. Size: 7" high, 6" long, 4¾" wide. Weighs* 8 *lbs. 6 oz.*

LITTLE INCH *(similar in design) takes 1" core rolls up to widths of ¾", lengths of 1,296". Adjusts for ¾", 1", 1¼" lengths. Size: 4¾" high, 4¼" long, 3¼" wide.*



1 Grasp shuttle and tape together between thumb and finger, tacky tape-surface under thumb.

2 Pull up shuttle until it stops (measuring strip).

3 Release your hold on shuttle and tear off tape with sidewise motion. Tape adheres to thumb in proper position for rapid application.

PATENT NOS. 2,170,722; 2,352,640; 2,502,641

Better Packages, INC. SHELTON, CONNECTICUT

World's largest manufacturer of Tape Dispensers

XUM

"Package by Inland"

This is your assurance that your product will have maximum protection in shipping, at minimum cost. Correct balance, proper bracing, crush resistance, ease of handling, and advertising appeal are assured when your product is in a "Package by Inland."

INLAND CONTAINER CORPORATION



INLAND

CORRUGATED FIBRE BOXES

INDIANAPOLIS, IND. • MIDDLETOWN, OHIO • EVANSVILLE, IND. • MILWAUKEE, WIS. • DETROIT, MICH.



It Is Cheaper, Easier, Faster to Close Cartons With Acme Silverstitch and the Silverstitcher



ACME SILVERSTITCHERS

answer the demand of large and small operators for a reliable, economical, time saving method of closing cartons.

Silverstitchers form, drive and clinch steel staples from continuous length coils of *Silverstitch* stapling wire . . . in all types of solid fiber and corrugated shipping cartons. These steel stitches resist the effects of temperature and humidity, and hold for the life of the carton.

Acme *Silverstitchers* are available in standard and special models to fit individual shippers' needs.

SILVERSTITCHER FEATURES

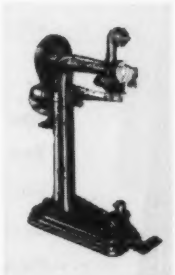
- Few moving parts mean lower maintenance costs.
- Adjustable single pedal control.
- Vital parts are reversible.
- Low power consumption.
- Heavy duty construction for long service.
- Silent V belt drive.
- Wide, comfortable foot rest treadle.
- Resilient one-piece feed wheels.
- Conveniently placed starting and stopping toggle safety switch.
- Over-feed with adjustable spring tension and unique wire friction plug provide constant and even flow of wire.
- Extra long life of main drive anti-friction bearing assured by use of genuine Promet bronze.
- Individual parts are precision made.
- Friction brake spring maintains continual pressure on clutch hub and simplifies brake adjustments.
- Easy to operate . . . runs smoothly and quietly.



Shown above is a bottom Silverstitcher—one of several standard models capable of handling all carton closing jobs. Throat openings 12", 20", 25".



This is the straight arm model for stitching sides and ends of many types of cartons — throat openings, 12", 20", 25" and 30".



Combination Silverstitchers unite bottom and straight arm features. Throat openings same as for bottom stitchers. Seam, top and special models also available.

ACME SILVERSTITCH FINEST WIRE FOR SPEED AND ECONOMY IN STAPLING

Acme Silverstitch stapling wire has proved itself on every stitching job . . . *on all types of stitching machines.* It is true to size and to temper, is rust resistant, and its bright, shiny appearance adds attractiveness to your cartons. It does not tangle or kink, and runs freely through the stitcher to make strong, securely clinched stitches which stay tight for the life of the carton. Available in 10-pound continuous length economy coils.

STANDARD SIZES

Width	Thickness	Feet per lb.*	1" Staples per lb.*	1¼" Staples per lb.*
.103"	.014"	211	2530	2020
.103"	.017"	175	2100	1680
.103"	.020"	148	1780	1420
.103"	.023"	129	1550	1240
.060"	.024"	222	2665	2130
.060"	.0205"	260	3120	2500

*approximate

WHAT USERS SAY . . .

- "We've reduced packing costs—increased production."
- "Acme *Silverstitcher* has been a lifesaver in our shipping room."
- "We make better boxes much faster."
- "Your *Silverstitcher* and stapling wire have been an important factor in the rapid growth of our Cut Meat Dept."
- "The *Silverstitcher* has by far exceeded our expectations. We highly recommend the *Silverstitcher* for better and faster work."
- "With the *Silverstitcher*, we are able to stitch our carton at a saving of over 50% in both time and material."
- "Formerly, we used gummed tape for sealing our cartons. Then we installed your equipment, began using your wire, and doubled our carton production."
- "Using your equipment and wire, we doubled our production of closed cartons."

SilverStitch SilverStitchers

ACME STEEL COMPANY

CHICAGO 8
2840 Archer Ave.
Phone: Lafayette 2200

ATLANTA
603 Stewart Ave., S.W.
Phone: Raymond 5171-2

BALTIMORE 2
336 St. Paul Pl.
Phone: Saratoga 1456

BOSTON 10
146 Summer St.
Phone: Liberty 9621

DETROIT 26
712 Book Tower
Phone: Cadillac 6190

LOS ANGELES 11
4901 Pacific Blvd.
Phone: Kimball 1245

NEW ORLEANS 12
309 Magazine St.
Phone: Magnolia 5859

NEW YORK 17
103 Park Avenue
Phone: Ashland 4-6470

PHILADELPHIA 6
201 Lafayette Bldg.
Phone: Lombard 8862

SAN FRANCISCO 7
432 Bryant St.
Phone: Garfield 7582

SEATTLE 4
1025 Sixth Ave.
Phone: Elliott 7534

ACME STEEL COMPANY OF CANADA, LTD.

MONTREAL
369 St. Paul St., W.
Phone: Marquette 6234

TORONTO
16 Church St.
Phone: Elgin 6700

VANCOUVER
990 Station St.
Phone: Marine 3621

WINNIPEG
Natl. Cartage Whse.
Phone: 96-238

XUM



RED STREAK

Sealing Tapes now come to you in this distinctive new package—

. . . but nothing has been changed except the package. You still get that strong, durable and yet flexible Red Streak Sealing Tape, liberally coated with fast setting glue. Why not speed up your packaging production with this superior tape? Red Streak Sealing Tape is available in a variety of different weights and colors. Write today for details and prices!

The Sealing Tape in the Candy Striped Package

BB BRAND

Flat as a Pancake

Gummed Paper

BB BRAND

"Flat as a Pancake" Gummed Papers are the ideal gummed papers for your labels—they lay flat and stick tight. A combination of good paper and glue make their fine performance possible. Write today for your samples and prices.

The BROWN-BRIDGE MILLS, Inc., Troy, Ohio

Dollar$ of GOODWILL for Pennies of cost

Many shippers learned the great value of better packaging methods, as a result of Government requirements for packing War materials. Shippers who value the goodwill which results from good packaging will continue to use these methods to increase sales.

A valuable adjunct to good shipping practice is the Packing List Envelope Protector.

Let Fabco Packing List Envelope Protectors continue the good work of QUICK CONTENT IDENTIFICATION.

WE OFFER—

(1) A full range of types and sizes, as below.
(2) Products fully meeting all specifications.
(3) Large production to insure prompt shipments.
(4) Attractive prices.

Sizes Overall—5¾", x 7", 6" x 8", 8" x 11", 10½", x 13".
Material—.080" weather proof asphalt composition board.
Packing—Cartons.
Lettering—Letters indented by steel die.
Dishing—To receive envelope containing shipping list.
This type is widely used, and meets specifications of all Armed Forces, and commercial requirements. Wide nailing flange and character of material facilitates nailing.

←DISHED TYPE





FLAT LETTERED TYPE→

Sizes—Any size*available—standard sizes 3x6, 3x10, 4x6, 5x6, 5x7, 5x9, 7x10, 8x11, 11x14.
Packing—Cartons, up to 8x11—over 8x11, steel banded bundles of 100.
Lettering—Letters indented by steel die.
**Material*—.070" and .080" weather proof asphalt composition board. This type is less costly than dished style, and as it also meets specifications, is frequently used in substitution of plywood, or metal protectors—or in cases where dished type is not available in required sizes. Lettering may be omitted, where special stencilling is needed.
*Thicknesses, other than these standards are available when specified.

Governmental Directive requires Packing List Protectors. If any of your shipments for the Army, Navy, Signal Corps or any of the armed forces go overseas, one packing list must be attached inside the packing case and two lists must be attached outside, on all containers that hold items of more than one kind.

We recommend the continuance of this practice for all Export shipments, as well as best practice for Domestic shipments.

Asphalt Composition Board is furnished by us specially fabricated in discs, die cut shapes, pressed forms, slotted separators, cylindrical forms, etc. Frequently used as substitute for critical fibre boards.

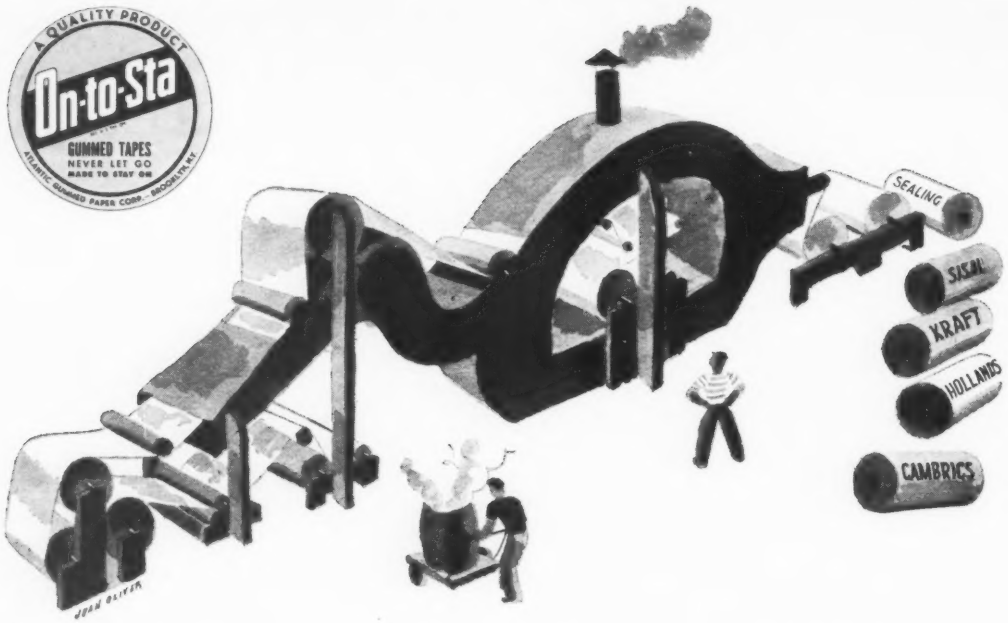
SEND US YOUR INQUIRIES

FABRICATED PRODUCTS COMPANY

701 Washington Rd. Pittsburgh (16), Pa.

XUM

A QUALITY PRODUCT
On-to-Sta
GUMMED TAPES
NEVER LET GO
MADE TO STAY ON
ATLANTIC GUMMED PAPER CORP. BROOKLYN, N.Y.



GUMMING IS OUR BUSINESS

That's Right! We're manufacturers of *On-to-Sta* Gummed Tapes and Specialties that are *made to stay on*. Assure yourself of efficient shipping operation and extra protection. . . .

SELECT YOUR GUMMED TAPES AND SPECIALTIES FROM OUR COMPLETE LINE

GUMMED SISAL TAPE ■ HEAVY GUMMED KRAFT ■ GUMMED CAMBRICS • ■ GUMMED SEALING TAPE, PLAIN & PRINTED • ■ "CARPAC" REINFORCED SEALING TAPE ■ ASPHALT LAMINATED WATERPROOF PAPERS, REINFORCED AND DUPLEXED ■ VENEER GUMMED TAPE ■ GUMMED HOLLANDS • ■ "SOLSEAL" WATERPROOF TAPE ■ CREASED GUMMED STAY • ■ COMBINING

• *SAMPLE BOOKLETS UPON REQUEST*

ATLANTIC GUMMED PAPER CORP.
MANUFACTURERS OF *"On-to-Sta"* GUMMED PAPERS
PLANT & MAIN OFFICE: ONE MAIN ST., BROOKLYN 1, N. Y.
BRANCH OFFICES: PHILADELPHIA • PITTSBURGH • CHICAGO • BUFFALO • BOSTON • ATLANTA • LOS ANGELES • HAVANA

XUM



MERCHANDISING

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Display in the store

by C. E. Hodder

Before treating the subject of interior display, it will be well to first define display advertising as a medium and put it in its proper place in the merchandising chain. By merchandising chain, I mean the events which lead from the time that the product is finished to the ultimate purchase of the product by the consumer. These events are largely made up of the different advertising steps. Such media as newspapers, magazines, radio, I call the educational advertising campaign. What is left is that medium which inspires the consumer to make the actual purchase, commonly known as display advertising.

It is the national or sectional advertiser's opportunity to deliver his message to the consumer at the place where the consumer buys. This message can be delivered at the end of the national campaign as a final phase of merchandising, or at the beginning of the campaign in order to prepare the market for the campaign, assure proper merchandising of the retail outlets, prepare the outlets themselves by way of showing them how much merchandise they need to be ready for the campaign.

Display advertising is equally divided into two parts: window and interior. I say "equally," because, in a recent survey it was found that, out of 397 national advertisers, interest was equally divided between window and interior display. By this I mean their primary interest.

The purpose of interior advertising can be broken down into six parts. The first of these is as a tie-in with the window display, which in turn is being used as an adjunct to a national advertising campaign. The window display itself serves the purpose of locating the advertiser's merchandise for the consumer who has read his advertisements, of giving prestige to both advertiser and retailer, of converting natural traffic to store traffic by calling the attention of the consumer to the merchandise if he has not already read the advertisements, and of continuing the national campaign to the very door of the outlet.

It remains for interior display to make a final tie-up. It must be remembered that a store can promote only a small percentage of its merchandise through its windows. Unless the dealer realizes that his job is only half done when he has used his windows to their best advantage, he will run the risk of losing the major part of his sales effort.

When the customers have been turned toward his store by national or sectional advertising, and brought into the store by good window display, then it is up to the merchant to sell them additional merchandise through proper interior displays. It is here that the dealer has a chance to convert the customer's *buying intentions* into *actual purchases* by supplementing the other advertising and the window displays with good interior advertising.

Impulse buying accounts for a large percentage of retail business. The average "shopping list" is only a guide or an outline to the shopper. Under the heading of impulse buying should be considered related selling.



The merchandise itself, supplemented by colorful packaging and display material, is frequently the most effective lure a retailer can employ. Here the convenient Coca-Cola carrying cases, accompanied by an "altruistic" related-item sales piece, stimulate last minute purchases from the vantage point of their position near the super market cashier's check-up counter.

Suppose that the merchant is featuring O'Cedar mops and floor polish in his window. This is only one item in his household department. If he fails to display the numerous items suggested by his feature item, then he is working mostly for one advertiser and is going to have an unpleasant surprise when he charges off his window against his inventory of household goods.

Interior display is used as reminder advertising—reminder that the customer can obtain the item from the store in which she is doing her shopping and that she need not go to the next store for it. She may not know that this particular item is carried by the store into which she has been drawn by the window display. While it is sometimes considered advisable for a store to be known among its particular customers for certain specialties, the trend is more toward general lines of merchandise than it was a few years back. Care should be taken by the merchant to watch those of his items which are not regularly stocked in this type of store. These are the stocks which are apt to suffer from lack of turn-over due to the merchant's own overzealous attention to featuring main items in window and interior displays.

An important purpose of interior advertising is to call attention to current local and national advertising. A merchant may ask why he should concern himself with calling the customer's attention to advertising after the customer has already entered his store. One of the important functions of display advertising in general is to give prestige to both the advertiser and the retailer: to the advertiser by showing that his merchandise is available and handled by the better retail outlets; to the retailer by building up his reputation for carrying the highest grade nationally advertised brands.

It is natural that the advertiser in planning displays should think first of his product and should think in the terms of sales of that product. Admitting the correctness of such thinking, the next question is how he can best sell his product in the retail outlet and, at the same time, sell the retail outlet on future promotions of his product.

There is only one way to do this, and that is for the advertiser to put himself in the place of the retailer when planning his displays. He must remember that the most important thing to him is the dealer's or retailer's acceptance of his displays.

The retailer's problem

The recent example of an important advertiser proves the necessity for such thinking. For use in drugstores, the advertiser developed a counter display which had a 14-in. lateral spread and a depth of 12 inches. The display was offered throughout the Manhattan area, in upper New York State and New Jersey. Fifty per cent of the outlets accepted the display, and 50 per cent refused it. It was found, upon investigation by the advertiser, that those who refused the display refused it because of the depth.

Listed below are further findings of this advertiser:

First: A large counter display will be accepted only if it is very fine and almost a display case in itself. The druggist is willing to cover his counter completely only if the display is expensive-looking, of a permanent type, and if it is an asset to the fixture-value of his store.

Second: The average modern showcase in a drugstore is not over 18 in. in depth. Old cases sometimes run to 24 inches. The value of this glass top is the fact that merchandise in the case is visible. This is the first reason for preference for shallow (from front to back) counter cases. The second reason is pilferage. Pilferage from dispenser-type counter cases is a large factor. Such a display which is flush or almost flush with the showcase-front lends itself to uncontrolled pilferage, whereas a counter display set back seven or eight inches is a protection against it.

Third: The important spots in a retail drugstore are: 1) the "back-bar space" or that directly behind the point of sale, 2) the shelf which runs opposite the point of sale on the other side of the store and divides the upper wall case opposite the counter from the lower and 3) the glass-topped counter itself.

The first two of these are narrow in themselves and therefore do not lend themselves to any but a narrow display. The advertiser who recently made this test by actual experience found out that three displays were most acceptable to the druggist. Sizes were: width—10 in., depth—8 in.; width—8 in., depth—4 in.; width—7 in., depth—7 inches. The sizes differed according to the size of the package being dispensed.

In the above case, the druggist did not register any general disapproval of wide counter displays. The depth was the important factor.

Referring back to the 50 per cent who accepted the original display, this is a natural result. Most of them "went along" with the advertiser because of his standing. Also, they probably hoped that the next one would be better.

The above example is cited to show the necessity for considering the man upon whose acceptance the advertiser depends for promotion of his merchandise. For the same reason, an advertiser cannot expect to make large oversize floor displays and force them into the retail outlet without any thought of the retailer's general merchandising plan. He must remember that his particular item is only a small percentage of the merchant's total inventory, and that he, the advertiser, can look for his display to stand on the merchant's floor for a much longer period of time if that display is built with the thought of helping the merchant to sell goods which are related to, and not in competition with, the advertiser's particular item.

The same is true of wall displays. The merchant's windows and interior display spaces are his only real promotion areas. His only interest is to sell as much merchandise as he can to every customer who comes into his store. For this reason, he is quick to realize what space in his store is not paying for itself, and such space is apt to be given over to other merchandise.

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An important factor in interior display is the location of the displays. Let us consider for a moment displays in the super market. Super markets are designed for the convenience of the customer; they are mostly self-service markets. This fact makes it essential that the customers become used to finding the merchandise on their shopping lists quickly and without searching. Therefore, the super market departments are very sharply defined.

For this reason, a soap display piece is practically useless if it does not come to the consumer's attention before she has bought her soap. Nor is it of much value to the advertiser to have the shopper informed of special prices in introducing a new canned soup when she has already pushed her carriage-basket almost to the cashier's counter.

Another example of this "correct spotting" of displays is that dispenser displays which lend themselves to self-service should be placed as near the cash register as possible, since these items, especially if they are small, are often picked out by the customer, and, if she has the exact change, can be bought and carried from the store without wrapping.

The retailer himself must, and will, control most of these phases of interior display; but at the same time, the advertiser, by showing his willingness to cooperate and advise in the correct placement of the displays, impresses the dealer with his cooperation and his ability to "talk the retailer's language."

Interior display tests

The results of display advertising are more easily checked than those of any other advertising medium; and, when checked, they are found to be more accurate. There is no need for conducting a poll or a questionnaire survey to obtain the readership of a window or an interior display: the cash register tells the story. Below are outlined the results of several tests:

Test No. 1—This test made by the A. C. Neilsen Company shows:

1. What happens when four advertised food products are properly displayed in 50 per cent of the retail grocery stores in a city.
2. What happens when the same four products are deprived of display in the other 50 per cent of the retail grocery stores in the same city.

Sales of the four advertised products were checked in every grocery outlet in the city to establish normal flow. In half the stores in the town, displays of the four test products properly supported by manufacturers' display pieces were set up. In the other half of the stores, the four products were kept on the shelves and no special displays were used. The test period was one week. Results showed:

1. In the 50 per cent of the stores where displays were made on the four test items, the average increase in sales during the test period was 35 per cent.
2. In the 50 per cent of the stores where no displays were made, sales of the four products slid down 28 per cent.
3. Net gain for week in all stores: 9 per cent.

Test No. 2—A leading liquor company made a test to determine the effect of display emphasis on one brand of gin. Before-and-after checks of sales were made in 45 stores. Retailers kept records of sales two weeks before the gin window was put in. Records were also kept of sales of four other gins in the same price class as the displayed brand. If the displayed brand showed sales increases at the expense of other brands, it would be obvious that while the manufacturer of the displayed brand had benefited, the retailer had suffered generally in gin sales. Results were:

1. The display increased sales of the displayed brand 157 per cent (average).
2. Sales of the undisplayed, or control, brands increased 12 per cent (average).

In other words, the display not only increased sales of the featured brand, but increased gin sales for the retailer generally, making the display of real interest to the retailer.

Test No. 3—George A. Hormel & Co. recently made a test to find out exactly what influence a good merchandising counter-display piece would have on the sales of Spam. The piece subject to test was the "Relato" display consisting of a central panel featuring Spam and a number of smaller, blank cards attached to the central panel and upon which the grocer could write in related items, such as bread, coffee, eggs, etc.

Tests were usually made on a two-week basis. During the first week, a normal quantity of cans of Spam were placed on the shelf in the regular section. An observer made accurate check of the number of women who stopped and looked over the Spam section. Check was also made of Spam sales for the week.

During the second week, Spam was placed on the meat counter and backed by the "Relato" display piece. The blank cards were filled in and placed on related items, which became part of a single related-item display. An observer checked the number of shoppers who stopped to examine this Spam setup. A check was again made on Spam sales for the week. Results were:

First week: Number of shoppers examining cans of Spam on shelves: 159
Number of cans of Spam sold: 3
Second week: Number of shoppers examining Spam displayed on meat counter with merchandising display piece: 227
Number of shoppers buying Spam after examining item as displayed (some bought two or more): 91

Test No. 4—This concerns a test made to answer three questions:

1. Will effective point of purchase advertising of nationally advertised merchandise bring about sales increases?

2. Does lack of effective point of purchase advertising result in sales decreases?
3. Does point of purchase advertising simply move purchases from nondisplay to display stores?

In February, a research agency inventoried 16 nationally advertised products in: 24 stores in which displays were to be installed; 23 stores in same cities where *no* displays would be installed; and three stores in a control city in which *no* display effort was made. In March, April and May, stocks of these products were again inventoried in the same stores. Purchases were checked from the dealers' invoices in order to secure a complete picture of the sales of these products in display and nondisplay stores. Purchases were also checked in display cities and in stores of the control city. In March, a merchandise type of display and an interior display fixture were installed in each of 100 drugstores. The 24 stores to be tested were included in this group. The operation was included in April and May.

The test proved conclusively that this display effort did not simply move purchases from nondisplay to display stores, but, on the contrary, resulted in a substantial improvement both in display and nondisplay stores.

In the control city, sales of 16 test products showed:

Loss of 6 per cent in March against February
Loss of 16 per cent in April against February
Loss of 24 per cent in May against February

As compared with the above results, sales in display stores were:

19 per cent better in March than in February, and 25 per cent better than control stores
16 per cent better in April than in February, and 32 per cent better than control stores
15 per cent better in May than in February, and 41 per cent better than control stores

Again, comparing sales in the control city with sales in nondisplay stores *in* display cities:

In March, sales in nondisplay stores were the same as February, against a 6 per cent loss in control city.

In April, sales in nondisplay stores were 7 per cent under sales in February, but sales in the control city were 16 per cent less than in February (or a gain of 9 per cent as compared to control city).

In May, sales in nondisplay stores were 4 per cent less than in February, but sales in the control city were 24 per cent less than in February (or a gain of 20 per cent as compared to the control city).

Test No. 5—This illustrates a survey made by the Market Research Department of *Colliers'* Magazine, to test the value of point of purchase displays. Full interior displays were set up in 18 grocery stores in 17 cities from Maine to California. A detailed record of dog-food sales was kept in each store for a full week prior to the display, and then for one week with the display. Results:

The average gain in sales in 18 stores was 126½ per cent. The largest increase in any store was 700 per cent. The grocers' profits increased because large percentages of extra business came from former buyers of cheaper brands.

Coordinated display tests

Earlier in this article, I spoke of related selling by means of properly coordinated interior displays. The following test will serve to show what can be done along this line. The test was made in a men's apparel store owned by Maurice Weiner of Newburgh, N. Y., a city of 40,000. The average sales per day were 60. Saturday sales averaged 500. Cluett, Peabody and Co. and Russell W. Allen Co. cooperated in the preparation of material for checking the study.

The purpose was to test value of proper promotion through related and open selling methods of such related items as shirts, ties and handkerchiefs. The problem was to bring merchandise out into the open where it could be seen and felt; to take "pick-up" merchandise from dead spots and put related items on display.

To accomplish this, shirts were put in a good traffic spot near the door. Two open cabinets were used to supplement the glass showcase. As each featured ensemble went on sale, it was stocked in the case and also displayed on top, thus bringing shirts out where customers could examine them.

The glass showcase was set up to display and stock fancy ensembles by using half the inside of the case for the shirt stocks being featured. Related displays inside the store were tied in with the windows and the advertising campaign.

Prior to rearrangement, with every 100 shirts sold, 20 ties and three handkerchiefs were sold. After the rearrangement, with every 100 shirts, 53 ties and 33 handkerchiefs were sold. During six months' operation of the plan, the merchant's complete original shirt inventory was sold in addition to a much greater percentage of his six months' purchases than ever before. The increase of shirt sales was greatly responsible for a *46 per cent increase in total store sales.*

Shirt patterns had been bought by this dealer in quantities of 1½–4 dozen. Buying increased to 4–6 dozen. Ties were bought in similarly increased proportion. Handkerchief purchases were increased from a minimum number for stock to four and six dozen per pattern. Fancy shirt purchases increased 33⅓ per cent. Tie and handkerchief purchases increased as much as 40 per cent.

Naturally, newspaper advertising was kept in line with expected sales, and window displays were tied in as much as possible with the nationally advertised feature when it appeared in magazines.

The above tests serve as examples to show the great possibilities which are open to the owner of a retail store. They only require proper coordination and planning of the store interior in order to get the fullest and best results from the last step in a successful merchandising plan. And store-interior display is this last step.

The dealer's stake in display

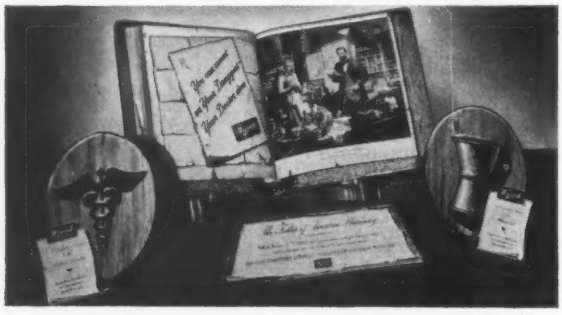
by Homer H. Johnson

This fellow, the dealer, promises to be a determining factor in future point of sale techniques. He has made money during the past four years—plenty of it—more than ever before. But, things are different now. The war is over and customers are going to be more choosy from here on. Brand name items they have not seen in a long time are once more appearing on store shelves, and things in general are not so hard to get as they were. So, it is time for this fellow, the dealer, to start worrying about his competitor.

A recent survey indicates that 95 per cent of all the nation's dealers plan to remodel their present locations so as to make them more attractive and appealing to the public. New frontages are being designed, new streamlined showcases are being installed and many improvements are being made which the dealer could not afford until now. He is investing wartime profits to make his Class-C outlet take on the appearance of an A-1 store. He has visions of becoming the leading merchant of the community in a few years.

1—Wyeth's display slogan: "You can count on your druggist," has great sales appeal for the retailer.

PHOTO, COURTESY EINSON-FREEMAN CO., INC.



2—During shortages, displays lending humor to irritating problems helped the dealer. This piece advertised bulk sales of a product formerly canned.

PHOTO, COURTESY ZIPPRODT, INC.



So, you see, Mr. Advertiser, we will have to consider the dealer in our display campaigns in dealer outlets, because he simply is not going to be interested in anybody or anything that won't bring customers into his store—to buy.

Millions were spent for elaborate window and store interior displays in the years before the war. Designed at great cost, many of these displays, destined as center pieces in store windows, were diverted into dark corners of cellars or other places so inconspicuous that at best they drew only the attention of the store cat. Possibly the reason why these displays never reached their proposed destinations was because the dealer didn't feel that he should let one product monopolize his window and thereby belittle other items that were just as good, if not better from a profit-for-sale standpoint to him—or perhaps he couldn't understand why the display failed to mention one of the company's products which had proved to be his best seller.

Yes, it stands to reason that now, more than ever before, the dealer and his viewpoints are of prime importance when planning a display campaign. His problems must be understood, and his good will must be won. To get our client's product before the eyes and into the homes of Jack and Joan American, we must first "sell" this fellow—the dealer.

First of all, our displays must blend well with the dealer's store interior, must give the rich, refined appearance of a Class-A outlet, must help dispense merchandise, and most of all, must attract the attention of the customers.

What types of window display will win the dealer's praise and cooperation depend largely on three things:

1. The dealer must feel assured that the sales of a certain product will be increased as a result of the display, and will not harm sales of other similar items.
2. He must know that other related items will benefit by the display and will likewise mean better turnover of stock.
3. He must be "sold" on the idea that the display is effective and will build up his entire business by drawing more people into his store.

A few years ago, a group of marketing students in the evening classes of a university—mature men with business experience—set out to learn what dealers actually do with their store windows and why. Their conclusions are valid today; what they discovered was fundamental.

These students selected independent stores in a

number of different lines, first for observation, then later for interview, and made careful reports of their findings. Chain stores were eliminated because they follow carefully organized and centrally controlled policies on window display, and the objective of the study was to ascertain the reactions of individual store owners, rather than those of managers employed by a large organization. These reports, classified and tabulated, reveal some valuable facts. Of most importance, dealers need tactful and sympathetic guidance. They *know* better than they *do*.

The average dealer, it was conclusively demonstrated, takes pride in his store. He wants it to show a profit, of course, but his pride is a personal, emotional thing. He wants his store to *look* well, and he has a keen sense of responsibility to the public he serves. In the matter of store and window appearance, the observation reports classified 56 per cent of the stores as very attractive; 38 per cent as moderately attractive, and only 5 per cent as unattractive, principally because of untidiness. As might be expected, jewelry stores ranked top in attractiveness, with drugstores a close second. These same outlets ranked highest in the matter of intelligent use of display materials.

For purposes of window display, dealers in all lines use advertising materials as well as the products they sell. The observation reports showed that for all types of store, the use of products predominated in a large majority of cases. In drugstores, however, the use of advertising materials predominated, possibly because they are the largest recipients of installation service provided by the advertiser.

The dealers were questioned as to which they preferred—a full-sized, window-filling display, or a display piece which could only fill part of a window space. The druggist, the grocer, the confectioner and the auto supply dealer said they wanted window-sized pieces. The jeweler, the hardware man and the tobacconist preferred the part size. The delicatessen store owners divided fifty-fifty.

Compare these expressed preferences with what the dealers believe, or what they *say* they believe, about the relative pulling power of a one-product window and that of a window displaying a variety of products. Disregard for the moment a demonstrated fact to which I will refer later, namely, that theme window displays compel better attention from the sidewalk than mass window displays. The point we are considering now is: what does the dealer *think* about it, and what does he *do* about it? A majority of 55 per cent of those interviewed preferred single-product displays, as against 45 per cent who liked a variety of products. Druggists overwhelmingly expressed preference for the single-product window; grocers voted two to one for it; but jewelers, hardware men and delicatessen men definitely liked the variety window, while confectioners and tobacconists were about even.

Now compare practice with opinion on the same point. Though the total vote favored the one-product window, the observation reports showed that actual practice was the reverse—over 70 per cent of the

3—Dealer convenience is a feature of this display which functions as a mobile storage and exhibit unit.

PHOTO, COURTESY W. L. STENSGAARD & ASSOC.



PHOTO, COURTESY FORBES LITHOGRAPH MFG., CO.



4—General Electric Co. keeps its dealers supplied with some practical sales helps designed to aid the customer to select lamps of the proper size. These two units, playing the same theme, show how informative a well-planned display can be.



PHOTO, COURTESY SNYDER & BLACK, INC

5—Full of human interest, this lithographed piece serves as a theme for a display of related items.

windows examined contained a variety of products while the balance were definitely theme windows. Delicatessens, jewelry stores, and hardware outlets show that their owners practice what they say they believe; the inconsistent ones appear to be the druggists and the grocers. All of which bears out the conclusion previously expressed: that dealers need helpful guidance.

But these dealers—*your* retail outlets, Mr. Advertiser—do not accept blindly and unquestioningly any display material offered to them. Why do they select certain displays and discard others? Here are some of the factors, as tabulated from the students' reports:

Appearance, colors.....73 mentions
Conscious tie-in with advertising of the manufacturer.....59 mentions
Nationally advertised items.....55 mentions
Profit-making article.....45 mentions
Importance of item in relation to the particular line.....34 mentions

Perhaps one of the most important questions which these students asked of dealers concerned the manner in which display materials reached them. The answers shed considerable light on the influences which are most potent in ensuring the actual use of point of purchase advertising. The answers follow:

Following salesman's call and explanation.....74 mentions
Professional installation service.....49 mentions
Without any notice from manufacturer.....38 mentions
Through dealer's request, replying to notice from manufacturer.....29 mentions

The significance of the foregoing lies in the fact that the advertiser cannot neglect any of the factors which influence dealers in their use—or failure to use—point of purchase advertising material. Before the war brought a protracted sellers' market, dealers were frequently condemned as "dumb." It is the writer's conviction that this condemnation, for the most part, is unjust, and results from a failure to sense the dealer's point of view. Whether it is true or not, the dealer is as he is, and no invectives will change him. The smart advertiser will recognize the facts for what they are and adapt himself to them.

Do these dealers' opinions coincide with demonstrated facts about the attention value of various methods of treatment? Not necessarily. The average dealer is not a student of marketing and merchandising theory—he follows practice more or less from habit. But there are facts that he should know and which he will heed if they are sympathetically presented. I have already given his opinions and summarized his practices; now for a word about how his customers—and yours—react to windows of various types.

Which of the following pulls better: a stockroom window in which is exhibited literally hundreds of odds and ends, a theme window which gives a good showing of any one single item, a theme-related window where it is possible to push many related items?

A survey, conducted by *Drug Topics* magazine, of drugstores in 24 cities throughout the United States reached these conclusions:

1. Mass window displays drew the attention of 1 out of 11 persons.
2. Theme window displays drew the attention of 1 out of 4.7 persons.
3. Theme related window displays drew the attention of 1 out of 3.2 persons.

Thus, as far as attention-getting value is concerned, these figures prove that:

1. Stockroom or mass display windows draw little or no attention and benefit neither the dealer nor the advertiser.
2. While theme display windows draw more attention than mass display, only the advertiser stands to benefit materially. The dealer may lose his rapid turnover of rival brand products.
3. Theme-related windows not only draw the attention of more people, boost the sales of many related items and increase store traffic, but also serve to benefit the advertiser as well.

Yes, the national advertiser must consider this fellow the dealer. He stands between the manufacturer and the consumer and he will no doubt greatly influence many sales in the prosperous years to come.

Display circulation and market coverage

by Frederick L. Wertz

The figures on display circulation published in *Window Display Circulation and Market Coverage—How to Select and How to Verify*, issued by the Advertising Research Foundation, are generally accepted as the correct estimate of the number of people who pass windows on the near-side sidewalk. These figures, however, are based upon controlled distribution. A specified and predetermined number of displays are installed in each business district, and such controlled distribution can only be secured by professional installation, based upon business district maps of each city covered.

When the advertiser does not use professional installation, or when he books his own locations through his sales force, such controlled distribution is manifestly lost. It would seem, however, that an advertiser may assume that the average circulation per window under controlled distribution is official and may feel reasonably certain of achieving at least this circulation with any displays, regardless of the method of installation employed. This would mean that in cities of over 100,000, the average weekly circulation per window, based upon the research report of the Advertising Research Foundation, would exceed 18,500 per week. If all cities of the United States over 10,000 were included, this average would be approximately 12,000 per display.[1]

Therefore, when an advertiser determines the number of his displays that are actually placed in windows, he can easily determine his maximum cost per thousand of circulation by multiplying by 12,000 and dividing into his total costs.

Perhaps there should be further research to determine what percentage of the people who pass by on the sidewalk actually *see* the average display. This would correspond to the reader-acceptance ratings on advertising in newspapers, magazines and radio. Outdoor Advertising plans a survey which will determine a rating to apply to advertisements on 24-sheet poster boards.

It will be difficult to establish a fair rating for display, because it differs from most other advertising in that it is constantly exposed, in large size, to every passer-by. The unconscious effect upon a person who does not realize that he has seen the display is probably considerable—but impossible to measure.

Another factor that must be included in any such measurement is the influence of display upon the dealer and his clerks. It is well recognized that anything which increases the interest in a product, or consciousness of a product, in the minds of retail salesmen is extremely important. In my opinion, it is quite probable that some such survey will be undertaken by the Point of Purchase Advertising Institute in connection with the Association of National Advertisers.

During recent years, the appreciation of the display as an advertising medium has increased greatly. It is no longer merely considered to be a "dealer help." Without a doubt, display may be used as an advertising medium with a definite circulation and market coverage, and a few advertisers have constantly used it in this manner for several years.

Any advertising medium which is used constantly must furnish adequate and continuous coverage of the advertiser's market, and such coverage is easily attained by use of displays. An advertiser who adopts a program embracing a minimum weekly showing of approximately 9000 displays in cities of over 10,000 in the United States will receive coverage for approximately 90,000,000 persons. If the program is repeated six times per year, the cost to the advertiser will be about $250,000, and it would deliver a circulation of about 600,000,000 at an average cost of about 40 cents per thousand.

Many advertisers whose products are seasonal could use display as a medium during the period of peak sales. Many could supplement other media by the use of display in spot areas where a more intensified coverage is needed.

The effectiveness of any advertising must be mea-

Displays must be adapted to the available window shape. In this case, the window was high and narrow.

PHOTO, COURTESY WINDOW ADVERTISING, INC.



[1] No method has as yet been developed for determining the number of "repeaters" in the weekly sidewalk traffic count, though it is well known that the pattern is similar from day to day. This opportunity to register repetitive impressions is one of the great advantages of window display advertising—one which benefits both dealer and manufacturer. (Ed.)

sured by its final result at the point of purchase, where the actual exchange of goods is accomplished. It is logical, therefore, that anything at the point of purchase which will serve to remind the shopper of any advertising he has read, seen or heard, is important.

Considerable interest is manifested by other media, including magazines, newspapers and radio, as to how much more effective all of the advertising which they carry will become if tied up concurrently with point of purchase display. Advertisers have also expressed great interest in this question, and it is probable that some definite research will be instituted along these lines as soon as the supply of merchandise in the retail stores is such as to warrant the expenditure.

Point of purchase display has the advantage of being used with 100 per cent selectivity. Advertising in other media must cover the market generally, but advertising at the point of purchase can be confined to the state, county or city areas, and even to individual retail stores which carry the product for sale.

Advertising with a circulation of millions does not have great sales value if only 10 or 20 per cent of the people reached by the advertising have an opportunity to buy the product. Practically no product has equal distribution and an equal proportion of potential sales in all areas where it is distributed. Some territories are always weaker than others. By the use of point of purchase display, these weak territories may be supported and bolstered with a greater advertising drive.

I often wonder whether or not an advertiser is wise in preferring to have his display material placed in those stores which are his best customers. From a selfish standpoint, I wonder if it would not be better for him to place his displays in those stores which are not giving him the proportion of their business to which he feels he is entitled.

It is a little difficult for most people to think of display in the same advertising terms as they think of other media since display is so specific and selective in its relationship to dealers that it appears to be entirely different from advertising which is broadcast to the general public. The answer to this is that display reaches the consumer where he can buy the product. If you want to convince a man on any given subject, would you consider that a broadcast appeal to the general public would be as effective as a personalized appeal at the time when he can act upon his conviction?

Undoubtedly, the successful sale of a product requires both forms of advertising. First, there must be a general education of the public in order to arouse an appreciation and a desire to purchase the particular article advertised. Second, there must be something at the point of purchase that says to the buyer "You can satisfy your desires here and now." Man's memory is short, and the "forgettin' " man is the most expensive item in advertising.

The experience of the War Advertising Council, continued postwar as the Advertising Council, is bringing about a better understanding and appreciation of each advertising medium. It may well be that out of this will come a better understanding of the functions and place of each medium and a recognition of the fact that they are all dependent upon each other.

A clearer recognition of the fact that advertising as a whole must prove its value in our national economy and must demonstrate and explain to the public its importance as a key factor in increased production and full employment, is also very much in mind today. As soon as production gets under way, competition for markets will probably be keener than ever. Profit margins may be less than they have been in the past, and every advertiser must scrutinize his costs of distribution more carefully than ever before.

Since advertising will be the key to increased consumption and therefore to increased production and full employment, it must be made more effective and more efficient per dollar cost. From all indications at the present time, point of purchase display will play a much greater part in the whole advertising and distribution scheme than formerly.

Only last week a woman living in a small up-state New York city said to me, "Advertising has made America what it is. By telling the people of new things to buy and how to use them, and by educating them to the use of greater conveniences and greater comforts, it has made it possible for America to have the highest standard of living the world has ever known." If every person in the United States could be made to realize this, it would not only be a great thing for advertising, but a great thing for the country.

A forward step in Government appreciation of the forces of advertising occurred in Washington, D. C., on February 12 and 13, of this year. Forty-five directors and sponsor-members of the Advertising Council, representing all forms and branches of advertising, met in the East Room of the White House at the invitation of top Government officials. These same officials spent two full days telling the advertising men of current Government problems, expressing a deep appreciation of the job advertising had done for Government and for the people during the war, and requesting a continuation of the same effective work in the sometimes more intricate and difficult problems of reconversion and peace. I believe it can safely be stated that no other group of business men in the United States has ever been invited to a conference of this nature.

The United States Chamber of Commerce has under consideration a policy statement on advertising. This will be the first time in history that the Chamber has given official recognition to advertising as a key force in our economy.

I believe that in all this new recognition of the value of advertising with relation to the public welfare, point of purchase display is going to play a far more important part in the future than it has in the past. It cannot be repeated too often that the climax of a complete advertising program for the sale of goods must be at the point of sale, for it is there that the opportunity is immediately present for gratifying the desires created by the entire advertising program.

The creative element in display planning

by John Palmer

The problem of creating window displays is about as easy a subject to cover in a few paragraphs as a theme like "How to Sell." But let's take a look at it and try to analyze some of the points which make the creative wheels go 'round. Lithographic window advertising is a distinctive field, requiring a type of creativeness widely different from many other forms of advertising and of graphic arts. Large areas are available, an unlimited amount of color and almost every kind of shape, size and third dimension—employed as individual pieces or in series.

The first step in creating a display is to determine the objective of the display effort; whether it is to make a direct, immediate product sale, whether it is to be a name-reminder, or whether it is to be an institutional piece supporting an abstract idea. With a definite reason for the display established, it must now be kept in mind that a good display always serves a double function. It not only declares the "point of purchase" to those entering the store, but it should also have the value of a miniature billboard, so that in a compelling, attractive way it will tell the story quickly to those passing by, both on foot and in cars. "Window Shopping" is a great American pastime. The window display often leads to a sale of the same product at another store (perhaps the consumer's neighborhood dealer).

The display should never lack a "good wallop" in color and shape, with the name preferably large and at the top. A window should contain enough additional supporting pieces along with a sufficient display of the advertiser's products, etc., so that the product being advertised will dominate the complete window. Window balance should be planned in advance, both as to shape and color.

The window display is an important member of the complete advertising team shooting toward a sale. It is the "touch-down" play—the sign which says: "Here it is!" "We sell it!" "Come in and see it; we will demonstrate it!" "Come in and *buy* it now, *today*."

Creative genius in display advertising generally results from years of application in the lithographic display business. Being a good art director or a good artist does not necessarily qualify one for the planning of a major display. It is the experience gained from having worked on hundreds of displays which enables one to eliminate so many "must-nots," to discard nonessentials, to avoid bad constructions and by using the process of elimination to grasp the "germ" of the idea on which to start the art work and construction. It takes a mixture of imagination, merchandising, advertising, art knowledge, "carpentry," sign painting and showmanship for a spectacular sales-compelling display.

What comes first? So many factors are involved that one thinks of the chicken and the egg. A number of points must really come to mind at the same time to hit the bull's-eye for a knock-out display idea. The wisest

PHOTO, COURTESY PALMER ASSOCIATES



1—Seagram's advertising campaigns manifest a co-ordination of effort on the part of client, agency and creative lithographer. Their window displays tie in with every other form of advertising which they use, thereby increasing the effectiveness of all.

XUM





2 and 3—Obverse and reverse of a single display piece with double value because it is printed on both sides. The interchangeable panels renew and maintain interest. Continuity is attained with variations on the theme.



4—A good slogan packed with meaning is doubly effective when seen on a colorful lithographic display.

advertising managers work just as closely with their creative lithographers as they do with their agencies, and oftentimes the cooperation of all three is highly advantageous—so as to carry into display advertising the general theme, the slogans and the major ideas for a complete tie-up embracing sales plans, publications, radio and the point of purchase.

Such a tie-up campaign is exemplified by the current Seagram display program. The Seagram Seven Crown slogan: "Designed for your Pleasure," (Fig. 1) is in pictorial form with a unique construction simulating an artist's easel, the easel board being on a slant. This is a three-plane display. The general sportsman atmosphere is maintained throughout and the product is shown in an attractive manner. Note how little copy is used, and yet the whole message is easy to get. Dealers themselves greatly prefer novel constructions. The Seagram Five Crown display (Fig. 4) illustrates the slogan: "When Taste Counts"—good liquor, good food and good taste. The waiter is on a front plane extension piece. This display illustrates the advantage of large units and the dominating pictorials just about tell the whole story.

The Seagram two-side display (Figs. 2 and 3) uses the slogans in a most interesting construction since it is a one-piece setup with the illustrations mounted on both sides of the two side cards which slot into the large base and the upright post. This display is visible not only from the street, but also from the inside of the store, which is a big advantage with the modern open-back windows. It was praised by many window installation companies for its sturdiness and novelty. The pictorial matter on the two sides of this display conforms closely to the Seagram advertising campaign in publications.

The Westinghouse window display series shows an interesting start of the development of a postwar line. The series, of which these four pieces are only the beginning, was worked out according to an extensive plan developed with the Fuller & Smith & Ross Advertising Agency and Westinghouse Advertising Department, each piece being fully merchandised through salesmen and broadsides.

The certified Westinghouse dealer medallion (Fig. 6) is a 26-in. circle using a patented gold spider web of aluminum foil. It throws forward an astonishing circle of light like the facets of a diamond, even when placed in dimly lighted positions; no light bulbs are used.

The development of the first two displays for specific radios in the Westinghouse line show two entirely different types of display. The "Little Jewel" display (Fig. 7) has the radio placed on an extended platform which also reaches back to form a concave circular area, the background being made from gold aluminum foil. It suggests a proscenium stage background for an orchestra. The lithographed hand suggests just how easily the radio can be carried by its novel handle.

The Westinghouse "Duo" (Fig. 5) is a display of a different type. It is practically a demonstration in a window of the new combination record-changer and lift-out radio which can be plugged in anywhere. Here the pictures tell the story. A window shopper would never know of these unique features without the



5—Westinghouse uses window displays to re-enter a post-war market after a long period during which their merchandise was off dealers' shelves.

simple pictorial explanation. The actual radio is placed on a small lithographic stand and the nameplate is another piece which locks onto the top of the cabinet, with additional display value.

The important slogan of Westinghouse Radio is: "Listen—and you'll buy a Westinghouse Radio." This is such an important feature in the general promotion that it was decided to put out for the dealers a beautiful permanent sign (Fig. 8); here the golden extension spider web is used with an all-gold flat back piece and the slogan in deep maroon. It is about 36 in. wide. Each of these four Westinghouse displays was created to carry through definite promotions in the start of the development of the broad Westinghouse dealer campaign.

The Moore paint window display (Fig. 9) is a large, beautiful three-plane shadow box to be used in the window as a semipermanent center piece in conjunction with various other product cards, color cards, paint products, brushes, etc. This display depends mainly on its beauty to inspire the public to want to "paint up." The three-plane construction permits using a

6 and 7—These ingeniously contrived display pieces are designed to catch and reflect light from any source. They not only attract attention, but they also succeed in creating an impression of quality for their product.





XUM



8—A wall plaque like this one conveys the feeling of a permanent and dependable dealer realtionship.

concealed plugged-in light, a device which intensifies the pulling power of the piece and adds greatly to its effectiveness.

The new Eversharp Schick Injector razor display (Fig. 10) is a product-selling window piece. The display planner will get the actual product into the piece whenever he can, but in this instance the actual product would be too small to convey any idea of points that should be stressed. Hence the device of a much enlarged blow up pictorial, by means of which the improved features of the razor are shown in detail. The price will be prominently featured. This is an attractive red display which just shouts: "Here it is—come in and get it."

What does it all add up to?

Examples could be multiplied indefinitely, but they would all point to the same conclusion: No good display is an accidental occurrence. It is the outcome of imagination, careful planning, merchandising knowledge and a sympathetic understanding of the consumer point of view.

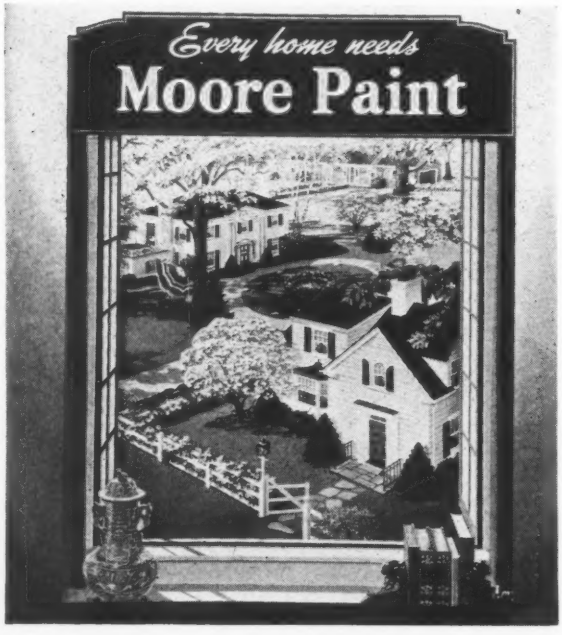
Who is the average consumer? A different person for every product. Hence the need for an *individual* study of each display problem in order, first to evolve the basic sales idea, then to dramatize that idea in practical form, usable by the dealers and attractive to the potential consumers of the product. Of the making of displays there is no end. Put the above-mentioned ingredients together and the result will be a new thought or a novel application of an old thought which will do the job at the point of sale.

Display, like everything else, has hit some pretty low spots during the past few years. But it is significant that even though crippled and restricted—ofttimes with little or no goods to satisfy the demand created—display merchandising has persisted. As business conditions become more settled, display will continue and there is every reason to believe its standards will be higher than ever.

One of the most interesting of postwar developments is the number of displays that are being ordered for export use—enough to make an important addition to the volume of display business. These require not only careful handling of copy but also careful checking of certain details in connection with the pictorials to see that they conform with all of the customs of the country.

For both export and domestic trade display, at the point of sale has greater recognition on the part of agency and advertiser. Like all forms of advertising, its value is utterly dependent on what is done with the space. That is the responsibility of the creative man.

9—Third dimension and color are used in this display to impress home lovers with value of paint.



10—Greatly enlarged illustration focuses attention on all the quality details of a well-known razor.



Preparatory work*

by Michael Gross

The reason lithographed displays are looked upon as the "Orphan Annie" among the various mediums of publicity is just because the advertising man persists in passing the buck to the display salesman; who passes it on to his art department manager; who, in turn, passes it along to the first artist on his staff who has a leisure moment. That sequence always has and always will make for mediocrity—the greatest scourge from which window and store displays suffer. It just cannot be done that way—successfully. A certain amount of groundwork must first be done and certain foundation stones must be properly laid. Disheartening though it may sound, it is up to you, the advertising man, to see to it that this essential portion of the task is accomplished efficiently and effectively. And of all the ways to go about the job, wielding the pick and shovel yourself tops the list.

See a dozen or more of your representative dealers; merchants who have shown that they are alert for any plan to increase business. Talk to them frankly. Tell them you want to get up window and store material which will meet with their approval—which will reflect their views.

But bear one thing in mind. Merely outlining your plan and then asking these men what they think of it will invariably result in a verbal barrage of: "Great stuff," and "Sounds fine to me!" which leads exactly nowhere. It may flatter your vanity to ask what lawyers call leading questions and thus be sure of receiving only affirmative answers—but these leading questions too often result in altogether misleading information. The dealer is only human and would always rather agree with you than cross you. However, one good way to get definite information without tipping off what you, yourself, have in mind, is to ask the dealer to show you the displays your competitors are distributing and then urge him to tell you what he finds wrong with them. You may discover early in your investigations that a product such as yours does not turn over fast enough; nor does it yield a healthy enough mark-up to warrant the dealer giving anything but counter space to a display featuring it; or that the material he receives from your competitors is altogether too large for the importance of the item; or, worst fault of all, that these displays feature the wrong selling point. Perhaps you'll find, to your utter astonishment, that what the housewife demands in your type of product is utility, whereas most of the displays featured a beauty appeal.

You'll come back from even a two-day trip of this kind with more factually founded information about what the dealer wants in the way of display material than you could have gotten in a month of burning

* Reprinted in condensed form by permission of The Ronald Press Co. from *Dealer Display Advertising* by Michael Gross.

1 and 2—Preparation work for displays like these includes not only the development of a sales idea, but also the arduous tasks of selecting models, posing them and testing hundreds of complexion shades.

PHOTO, COURTESY EINSON-FREEMAN CO., INC.



PHOTO, COURTESY BROOKS & PORTER, INC.



the midnight oil trying to figure it out for yourself. You'll have a new and accurate conception of what size your new display should be; how it should be constructed; and what selling points it should feature to make the storekeeper anxious to display it.

Window and store displays must be aimed at the dealer—not through him. If he doesn't think the material you send him will help sell more goods, he'll junk it —nor will all your excited talk about the low order of dealer intelligence serve to cancel half a line of that inexorable fact. After all, it is the dealer's window and you are merely a guest, coming in only if you are given an invitation. One sure way of being invited is to stop thinking about your problems and your sales and begin to pay a little attention to the dealer's problems and his sales. Always keep uppermost in your mind the fact that you need the dealer far more than he needs you, despite all you may have heard about building up such an overwhelming call for your product that you will force the dealer to carry it.

The more time you spend finding out from your dealers themselves what they really want and the less time you spend guessing what they want (or getting some display salesman to do the guessing for you), the more successful your finished displays will be.

But, important as it is to get this dealer viewpoint, the groundwork has not been fully laid when you have heard all he has to say. It is now necessary to do a little digging among your own salesmen. Either in person at a sales conference or by individual letters while he is on the road, every man on your sales force should be told that a window display is being planned and that any helpful suggestion that he can give you will not only be appreciated but immediately acted upon.

3—Art work for a display piece is often an original sketch, such as was used for this cut-out.

PHOTO, COURTESY KINDRED, MACLEAN & CO., INC.



While it may be true that the average "knight of the grip" understands very little about the mechanism of consumer-response or the psychology of perception, you must admit that he does get around. He talks with dealers every day, intimately and frankly. He can tell you if the storekeepers in his territory will give window space to a display featuring the line or whether they will use only counter cards. He has discovered, by asking the direct question, exactly where he will be allowed to put up a window streamer, arrange a floor pyramid or tack a show card on a bare expanse of wall. And he won't be guessing. He does know.

An advertising man will invariably come closer to producing a 100 per cent perfect piece of store advertising by listening to the advice of his dealers and salesmen than he will from the layouts he makes sitting in his office, or that the lithographer's representative brings around to him. Merely summarizing such information as he receives will, at least, give him a cue as to whether he wants a window cut-out or just a counter card; what the approximate size should be; whether the actual package should be featured or left off; and if the selling price is to be played up, subordinated or eliminated altogether. The wrong guess on just a single one of these factors has doomed to failure any number of displays.

I have seen $1200 worth of sketches submitted on an order that couldn't possibly amount to over $750. Aside from the economic loss to the various lithographers there was invariably an aftermath of squabbles and petty bickerings. As the same story had been told to each lithographer's salesman, and as not one of these men had anything in the way of an original thought to add to that story, it was only natural that the submitted sketches would bear some resemblance to each other. And, because these designs did look alike, a flood of charges would immediately break forth when the winning display was placed on view. "That fellow lifted my idea bodily," one of the losers would cry; "You stole the construction from the sketch I submitted," would wail another; "That way of holding the package was orginated by us," would yell a third.

In point of fact, this condition became so bad that it forced buyers of display materials to turn to their advertising agencies, have them prepare display sketches, and then ask a few of the leading lithographers to figure on reproducing them. But this didn't work out so well, and doesn't to this very day, for a very good reason. Advertising agency training is in one direction only: the preparing of material to appear in newspapers and magazines. All of this copy is planned for what is known as a "short throw," meaning that it must be definitely designed to be read about six inches from the eye. But a window display, to be successful, must be conceived for a "long throw"—it has to get its selling message over six feet from the eye—and the technique of preparing such material differs radically from pe-

riodical advertising. Another difficulty an agency man is up against is that all his experience is in mediums possessing only two dimensions: length and breadth, whereas a show window has a third one, depth.

Well, here is how the modern advertising man finds a solution. First, he makes his own selection from among the lithographers who call on him. Secondly, he makes a habit of scanning the imprints on the really outstanding displays he sees about town. And, thirdly, he consults the display sections of the advertising magazines. Having discovered who the display specialists are, he gets in touch with not more than four of them, puts his problem before their representatives and asks for a few visuals, rough sketch ideas, from each.

There is no finer spur to a creative artist than letting him know he is pitting his ability against that of some rival display expert. There is also no better whetstone for an estimator's pencil than the knowledge that other lithographers are figuring on the same job.

And now you are finally ready to talk to the representatives of the lithographers who are going to work with you. Give them such basic information as whether you want a window display, counter card, hanger or floor display; what type of store handles your product; whether or not you sell through jobbers; and what your plans are for distribution. There remain such secondary important questions as: "Are you going to ship the display with the merchandise?" If so, the salesman will want to know the size of your shipping container, so that he doesn't bring around a sketch which will have to be folded sixteen times to fit into it. Is the display to be shipped by itself? Then the size must be kept within parcel post limits.

Telling the salesman the few essential things he must know if he is to do a sensible job doesn't constitute, by any stretch of the imagination, furnishing him with an idea. You are merely fencing him in, so to speak, to keep him from wandering all over the lot. If you have consulted your dealers and salesmen, you are in the happy position of not having to ask the display salesman to guess. You tell him, instead.

Another thing the salesman will want to know is what quantity you were thinking of buying. Actually, the size of the order is furthest from the mind of the salesman when he asks that question. Although it rarely occurs to the man on the buying side of the desk, quantity does make a difference in the type of sketch to be submitted. If you want only a thousand cut-outs, the salesman knows he must caution the art manager to stay away from elaborate constructions, complicated die-cutting and designs that will take many colors to reproduce. The quantity is far too small to absorb the heavy initial cost of elaborate engravings and dies. On the other hand, if you have in mind buying 10,000 three-piece, 28-in. by 44-in. screens, the art department can let itself go the limit, for now the run is large enough to completely absorb the whole cost of preparing the job.

Now comes the salesman's parting thrust—and it has started more arguments than anything else in his repertoire of interrogations. The fireworks usually start—although there is no real reason why they should—when he asks: "What do you expect to spend per display?"

There is one reason, and one reason only, that prompts the salesman to ask that question. He wants to know which artist to use and what type of display to submit that will come within the price limit you set. A certain artist, who specializes in just the very subject you want to feature on your display, may charge as much for one of his roughs as you would care to pay for the whole edition of finished cut-outs. How is the salesman to know that the assignment cannot be given to this particular artist unless you tell him what you propose to spend?

The best way to dispose of the price situation, fairly and tactfully, is in a manner such as this. Say:

"In getting up your sketch, bear in mind that we can't possibly pay over a dollar each for every 10,000 displays inserted in corrugated containers and sealed ready to ship. Of course, the more you can cut under this price and, at the same time, give us a real merchandising idea, the better will be your chance of getting the order."

Now let's see how far we've come. You've told the salesman the type of display for which you are in the market, based on your own knowledge of the definite dealer requirements; you've told him the quantity you want and what amount you care to spend per display; you've told him how the material is to be shipped and when the job will have to be delivered. This information should ensure a successful display.

4—In direct-color photography of fresh produce, work must be swift and sure to forestall wilting.

PHOTO, COURTESY FORBES LITHOGRAPH MFG. CO.



Getting displays used

Window display has been called an "elective medium," because it depends so much upon the choice or decision of the retail dealer. This is a psychological factor. But there is another factor of equal importance, and that is the physical distribution problem.

Like every other advertising medium, window display suffers from a certain amount of waste. In many cases, fear of this waste on the part of the advertiser may operate to prevent the use of the medium altogether. The wastes may occur because of inappropriate messages or because of failure to meet the dealers' ideas of attractiveness, but often they are due to the wrong choice of methods of physical distribution.

Perhaps the most common method of distribution, particularly of smaller pieces, is shipping the display with a consignment of goods. This method has the advantage of low cost, the carrying charges being reduced to a minimum. Further, it makes sure that the dealer-recipient has both actual goods and display, but the method also has certain disadvantages. For one thing, too much is left to chance. A display should be merchandised or "sold" to the retailer if it is to produce fullest value. If the goods are handled through jobbers, the likelihood of waste and spoilage is increased; big buyers may get more display pieces than they will use, while the smaller dealers may get none.

Another common and inexpensive method is to send a broadside to the retailers accompanied by a reply card for the dealer to fill out, making his request for the display. If the broadside is mailed, it can be made to reach dealers everywhere, with the chance of interesting some who do not carry the line. On the other hand, the "scattershot" mail method itself may have a large waste circulation. Further, the lack of personal touch results in few responses from Class-A dealers, and many dealers who send for the material may not install it. The advertiser has little control over the installations.

Prior to the war, the Western Union Telegraph Company instituted a display distribution service which was interrupted by the war but will probably soon be reinstated. This was a modification of their special messenger service, offered through some five or six thousand offices of the company throughout the country. The service was offered on a definite rate schedule ranging from 15 cents per call and upward. The advertiser would ship the required display pieces to a distribution point and Western Union messengers would deliver them to retail stores, even making simple installations or setting up counter pieces. The advantages of this service included the possibility of selecting special areas to be covered with the assurance of delivery of special messages, and the reports of a responsible distributor of the materials. This method of delivery, in itself dramatic, makes it possible to select specific dealers or a specified number in selected lines of business. The drawbacks are that the service is in the hands of young men with little or no merchandising experience or background who are required to make a specified number of calls within a given time. This necessitates speedy operation with reasonable assurance of delivery but no certainty of installation, particularly in first-class stores.

Lines like radios, refrigerators, washing machines, etc., have in the past been able to put their display campaigns on a charge basis. One automobile tire manufacturer has made it a practice to charge an annual fee for the supply of store display pieces. As a rule, this practice is followed only where there is an exclusive dealer franchise in effect covering the representation for a high-priced unit of sale. When dealers pay for display material, the advantages are twofold: First, there is a greater respect for displays on the part of

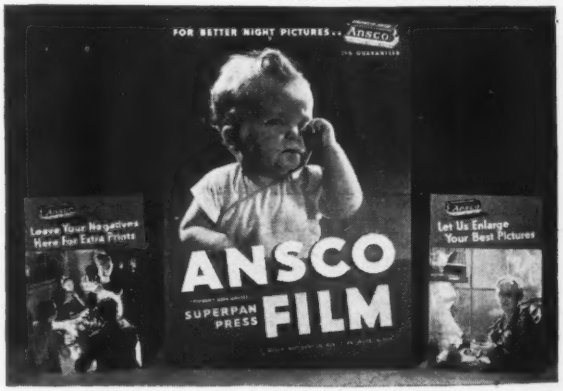
1—Prior to distribution, a display piece should be set up for a final check of its effectiveness.

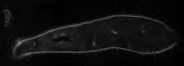
PHOTO, COURTESY FORBES LITHOGRAPH MFG. CO.



2—This three-piece display folds compactly into a shipping case for distribution by mail or express.

PHOTO, COURTESY KINDRED, MACLEAN AND CO., INC.







PHOTO, COURTESY WINDOW ADVERTISING, INC.

3—The experienced eye will immediately "spot" this as a professionally installed display, uniform in character and appeal with thousands of others that constitute a national advertising campaign.

dealers. This results in more intelligent and assured use. At the same time, the manufacturer is able to invest in the very finest types of display even though the quantity he uses may be smaller.

A practice quite opposite to the foregoing is followed in some of the low-priced staple or convenience lines such as cigarettes. Here frequently it is a practice to pay dealers for the use of their windows by means of "free goods." There is something to be said, of course, for the idea of paying for space; the dealer's windows are a valuable advertising medium, as both he and the advertiser realize. The advantage of this practice is that the dealer ordinarily will hold to his bargain when he makes it. The disadvantage is that there is no standard—the bargain is based on barter.

Many organizations, both small and large, include among the duties of their salesmen that of interesting the retail outlets in the use of display material, and some of them devote considerable attention to training their men in the actual installation of displays. It has been demonstrated that the advertiser's salesman is one of the most potent factors when it comes to inducing dealers to permit display installations. In normal times, the ability to obtain a dealer's order can be accompanied to good advantage by an interest in his selling the goods. The salesman can manifest both—and ensure a quicker repeat order—by helping his dealers use display materials intelligently. This, of course, assumes that the salesman thoroughly believes in the benefits of spending time in display installations. Unless he has this confident belief, he is likely to think more in terms of immediate orders than in terms of a permanent business relationship with his outlets. This plan involves careful sales training and supervision.

When their operations warrant it, the large national distributors utilize display crews of their own. The work of these crews is supplementary to that of the sales force. They are carefully trained in installation practices and are familiar with the merchandising of the goods. When an organization is large enough to permit this plan, all aspects of the display program are completely controlled. The advertiser can spot his displays according to his own merchandising plans and has an excellent chance of inducing Class-A dealers as well as all others to use his materials. The only drawback is a possible difficulty in working to a timed schedule—that is, the activity of the display crew may not be perfectly synchronized with that of the sales organization.

Professional installation organizations offer the solution to the display problems of many advertisers. Associated in these groups are trained installation men who operate in all parts of the United States. An advertiser selects the territory in which he wants his displays to appear and makes his contract with the installation service at a "per window" rate. He may even decide on how the installation is to look, setting up a model installation and conveying instructions by photograph. He can "spot" his displays according to a definite distribution plan. He can set a date, timed with a space-advertising campaign so that his two programs will "break" simultaneously. He gets a signed report which is certified by his dealers. The service is checked carefully and he is billed at an agreed rate per display. The expense of this method is in direct ratio to the amount of coverage he desires. The one drawback may lie in the fact that the selection of dealers may be left too frequently in the hands of the local installer who may have entree to a number of dealers whose stores may not necessarily be the best outlets for the particular advertiser's products. This can be overcome by a careful coordination of the activity of the salesmen who cover the territory. The salesmen should select the outlets where they wish displays spotted, making arrangements with the dealers for subsequent installation by the professional service.

Whatever method of distribution is adopted, the advertiser must "police" it assiduously. This being done, he assures himself of the benefits of a powerful advertising medium.

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Displays of durable structure

Most merchandising displays are of a temporary character. In the very nature of things, that is as it should be in the majority of cases. A display is a show—and every show should be changed with reasonable frequency.

But occasionally a product or a merchandising situation is such that a more durable display is called for. Stock turnover, for instance, may be slow, and the average dealer might not be justified in carrying a heavy inventory. But he may nevertheless be an enthusiastic supporter of the line, or, equally to the point, be made an enthusiastic supporter, and therefore his store is a good spot for a display piece of more than ordinary durability as a symbol of a permanent manufacturer-dealer relationship. Particularly has this been desirable during the shortage days when goods were difficult to obtain.

Many a good name has been kept prominently before the public and in the minds of retailers through the fact that displays of durable structure were simply too good to be thrown away.

1—Utilitarian display rack carries stock, gives prices, makes sales and tells dealer to re-order.

PHOTO, COURTESY THE GRAY WIRE SPECIALTY CO.



Additional advantages

A durable display frequently makes it possible for a prospective purchaser (or a casual observer) to examine the product without detriment to the stock of goods by displaying a sample in such a manner as to take advantage of the manipulative impulse that is so powerful with most people. Even when intent on the purchase of something entirely different, a casual observer may be converted into a buyer by being shown and given the opportunity to handle a product which has been well displayed.

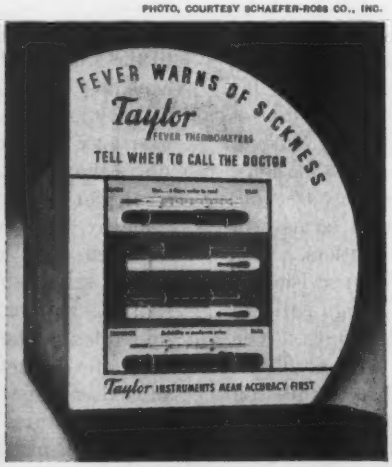
In many cases the goods may be of a nature or size that permits the display to have a cabinet or a compartment where the stock is kept and from which it is dispensed to the customer. The dealer thus is furnished an easy and convenient method of maintaining his stock. Often, too, the back panel of a durable display can be utilized to present succinct sales points for the guidance of clerks who can't possibly keep in mind a

2—(Left) Quality display plaque is three-dimensional trade-mark on velvet background against natural oak. 3—(Center) Pilferproof counter display of wood-finish heavy cardboard and glass. 4—(Right) Combination of gold and ivory coloring, wood, textiles, plastic and electric lighting for jewelry stage setting.

PHOTO, COURTESY KAY, INC.



PHOTO, COURTESY SCHAEFER-ROSS CO., INC.



PHOTO, COURTESY ARROW MFG. CO.





PHOTO, COURTESY FEDERAL STORE EQUIPMENT CO.

5—Air-conditioned display cabinet keeps confectionery fresh and producer's name before public.



DESIGNED AND PRODUCED BY W. L. STENSGAARD & ASSOC.

6—Push button and ring chime—display gets action from observer and provides storage space.

complete selling talk for every article the store carries.

In materials, structure and treatment, durable displays can be made to convey any desired impression. If the product is strictly a utility item, calling for frequent or periodical replenishment of the stock, a display that is strictly businesslike is in order. On the other hand, if the product represents an occasional or luxury purchase, the display must be surrounded with all possible elegance and prestige value.

Wood is a favorite material for the durable display. Even when the lumber shortage was most acute, the display builder was not too badly crippled, because he could use small pieces. Wood can be finished in a variety of colors and textures, is light, strong and adaptable. Textiles of various kinds form decorative backgrounds of an interesting character, and many durable displays are constructed to utilize electric lighting to good advantage. Wire construction is very suitable for some purposes, sheet metal for others, while some of the plastic molding materials or sheetings add the sparkle of color or the lure of visibility. Several creative display organizations have carried display showmanship to a very high point by their ability to use these materials effectively and appropriately.

The first cost of a durable display is higher than those of a temporary type, but when considered from the standpoint of its probable length of service, a durable display is in reality quite economical. As one expert in the field puts it: "A short-time display may cost $2.00 and it will be installed for a week—that is about 30¢ per day. A durable display may cost $6.00 but it will be used for two months—at least—that's 10¢ per day."

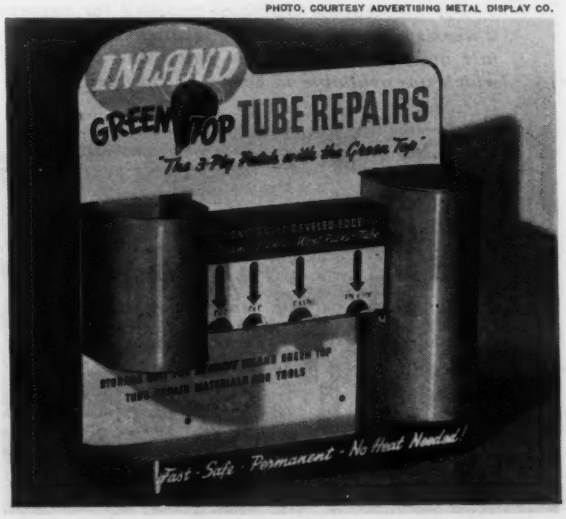
When he is planning a good merchandising program, the advertiser should look well into the merits of the durable types of display. If circumstances warrant, that type will prove itself a good investment in terms of increased product sales.



DESIGNED BY JOHN B. GUTTMAN & MAX ROSEDALE. PRODUCED BY DESIGN CENTER, INC. (PAT. APP. FOR)

7—(Above) Transparent plastic ("Lucite") mounted on pressed wood base displays Du Pont combs.
8—(Below) Enameled sheet metal display becomes work bench, storage place, advertising reminder.

PHOTO, COURTESY ADVERTISING METAL DISPLAY CO.



XUM

Using supplementary materials effectively

Not without reason does the retailer call it his "show" window. It is the place where he puts on his show, and he recruits his cast from many sources. His fundamental purpose is to get people inside the store and sell them some of his goods.

Sometimes he seems to lose sight of this fundamental purpose. In his efforts to attract the attention of the passerby, he may put into his window something more or less remote from the goods he has to sell—like the druggist who put in a window full of baby chicks to promote the sale of Easter egg dyes. He gathered a crowd, but few of them came in to buy.

By and large, the methods of filling store windows may be reduced to a basic three—whether the installation is by professional or home talent:

1. Merchandise only—either a mass display of one product or a miscellaneous assortment of many products, with little else except perhaps price tickets
2. Display material, lithographic or of other material, supplemented by a representative showing of related products
3. Accessory materials and "props" to create a special atmosphere or to tie in with an event or a season

The good showman will use all three, varying his method to suit the product, the season or the class of purchasers he is trying to reach. The manufacturer of a nationally distributed packaged product, however, is more or less at the mercy of his retailers. If he can, he will convey ideas to them about the effective uses to which display materials can be put in helping to sell his product. In some cases, the volume of sales or the unit price of the product may warrant supplying some of the supplementary materials to go along with the main display piece. Some manufacturers make a practice of setting up a display in an actual or simulated window, prior to its general release to dealers, in order to determine how to make the most impressive showing. Photographs are taken or line drawings made for distribution to dealers or installation crews. Thus, at a cost of a few cents per window, some assurance of greater effectiveness is provided.

1—For lithographic displays installed for perhaps a week's showing, effective backgrounds and pedestals are provided by crepe paper and corrugated, which are available in colors and printed designs.

PHOTO, COURTESY WINDOW ADVERTISING, INC.



This bit of advice comes from one who has had long experience in this "preview" plan: "After you have finished setting up a sample display, go out of the room and come back a little later for a fresh view. If the first thing you see is the advertising message and the product, you have done a good job. But if it makes you exclaim 'Oh, what a beautiful window'—if the color and arrangement of the decorative material is more striking than the advertisement and the product, no matter how beautiful the window is, you have overdone the job."

An advertiser can sometimes stimulate dealer cooperation in displaying his product by offering a cash prize for the best installation of his display material, judgment being based on a photograph of the window. Back in the days when selling was more of a problem than it has been recently, this method—and its many promotional angles—was quite commonly used.

The accessory materials which are at the service of the display advertiser include a wide variety. For backgrounds and floor covering, crepe paper is most widely used, with single-faced corrugated a close second. Both are available in many colors and with printed designs. One advertiser estimates his average cost per window at about 25 cents for crepe paper; corrugated used in the same manner would cost perhaps 75 cents per window.

Selection is by no means limited to papers. Background materials also come in textiles—silk, rayon, velvet, burlap, foils and plastic sheeting. One manufacturer specializes in textiles with embossed or printed designs, laminated to paper backing.

Biggest users of materials of this kind are doubtless the retail stores, particularly chain organizations and department stores, where careful attention is paid to the decoration of shelves, ledges, show cases, back-bars, columns and windows. An increasingly large volume, however, is being used for supplementary decorative purposes in connection with point-of-purchase advertising of nationally distributed packaged merchandise.

In the use of these various materials, the point calling for most careful thought is the choice of colors. As with all other forms of advertising, the copy message and the details of the product are of paramount importance. Colors serve merely to enhance that message and those



PHOTO, COURTESY REYBURN MFG. CO., INC.

2—An "atmosphere" display is particularly appropriate for a seasonal theme. Here, paper materials are used to great advantage in linking product with holiday in the mind of the passerby.

features. Colors should never "steal the show."

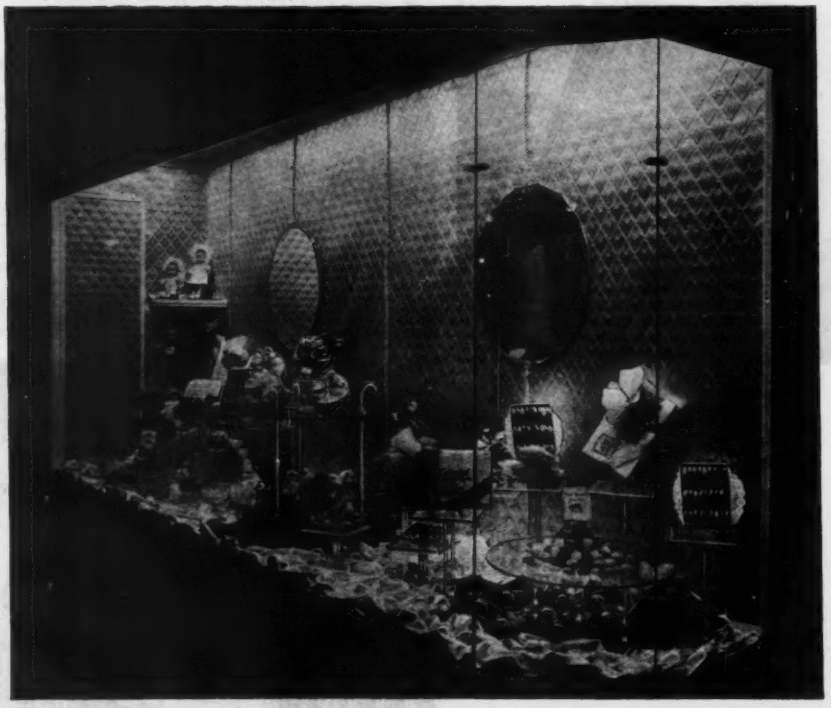
Least intelligently used color is white. Few people realize its power. It is a blend of all the colors, and in a window display is the strongest color we have. A single spot of white in a window will attract the eye quicker than any other tint or shade. White should be used always with care and judgment. There are times when a solid white background will be tremendously effective because it will be an attention-compelling setting against which advertising message and product will show to excellent advantage.

Another common mistake is to overdo the decorative element and put in a lot of fancy "doo-dads," curlicues, fringes or other contraptions that are as much of a distraction as improper use of color. They, too, direct attention to themselves rather than to product or advertising message.

Lighting is a problem, particularly for interior displays where, as a rule, the lighting is not so strong as it is in the window. This calls for playing up the colors a little more heavily for displays inside the store. In either case, if at all possible, the source of the light should be concealed. Sometimes a striking effect can be achieved by back-lighting, but that requires even more care in concealing the source of the light so as not to interfere with observation from the sidewalk.

There is no way of laying down hard and fast rules which will apply to the effective use of supplementary materials. Colors, background material, arrangement of "props," lighting—all call for good taste and showmanship, but those qualities must be guided by advertising and merchandising judgment. At the same time, display expenditure must be in proper proportion to the nature and price of the product being advertised.

PHOTO, COURTESY KAPLAN PRODUCTS & TEXTILES, INC.



3—For longer-lasting window trims, where the merchandise itself is the principal feature in the display, impressive backgrounds are supplied by the use of such materials as this, where an embossed rayon yarn fabric, laminated to paperboard, appears on walls, with a floor covering of ruffled satin. The display stands and fixtures are of acrylic.

XUM

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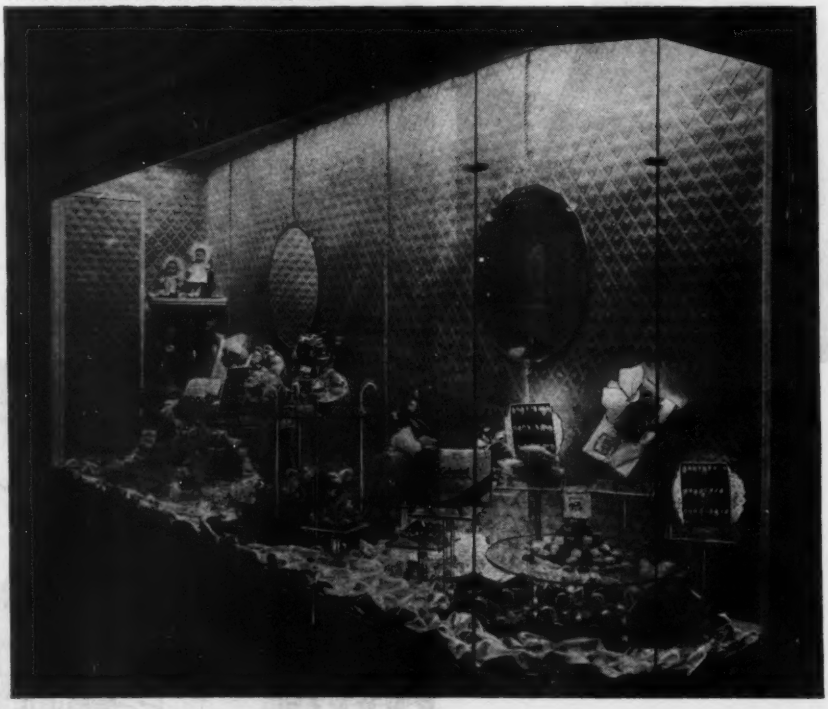
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Display Review~1945

Like every other commercial activity in war time, point-of-sale advertising had suffered through shortages of materials and manpower, as well as unavailability of the products customarily found in windows and on counters. Many advertisers, however, knowing the value of this medium, ingeniously contrived to meet the shortages with whatever materials came to hand. The displays of 1945 perhaps were smaller and fewer—but nonetheless effective. All of the pieces of point-of-sale advertising illustrated in the pages which follow appeared in MODERN PACKAGING *during the year 1945. They are presented not simply in recognition of an adaptation to unusual conditions, but more particularly because a study of these illustrations will stimulate ideas which can be carried out still more effectively as necessary materials become more available.*



←

Exporters to South America adapt American display methods. This piece shows the familiar blue and white Phillips Milk of Magnesia package reproduced in color cutouts arranged in step formation. Knocks down flat and is easy to set up. Credit: Pioneer Mounting & Finishing Co. and Industrial Lithographic Co.



↑

Counter display made entirely of cardboard takes the place of scarce metal cabinet. Heavy construction supports glass window. Wood-grain lithography gives impression of permanence. Equal in effectiveness to the metal display formerly used. Credit: Leon L. Berkowitz.



←

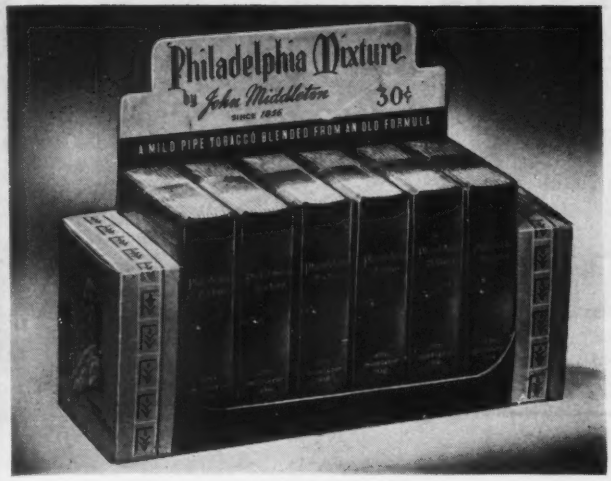
The United Drug Co. used display advertising to encourage consideration by young people of a career in pharmacy to counteract personnel shortage. Center piece reproduces a painting by George Rapp. Credit: United States Printing & Lithograph Co.



←

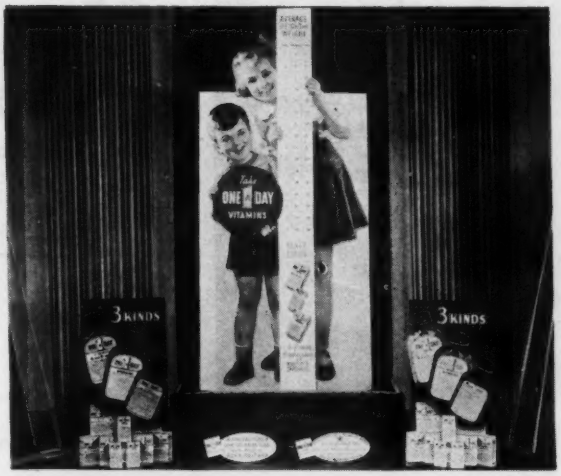
Aunt Jemima, life size and in full color against a background of Aunt Jemima Ready-Mix Pancakes and Buckwheat Cakes, increases retail sales in all territories according to the Quaker Oats Co. Credit: W. L. Stensgaard & Assoc.

XUM



Six packets of John Middleton's "Philadelphia Mixture" tobacco packaged to resemble rare old books were packed in a carton which had the advantage of combining the features of both shipping and display. Credit: National Lithograph Window Advertising Co.

Mothers with growing children couldn't miss these two healthy youngsters peeping out from behind a weight-and-height chart—couldn't miss the "1-a-day" Vitamin message. Credit: Forbes Lithograph Mfg. Co.





Spotlighting a package in dramatic fashion to attract attention to the central theme of the display—this advertising objective is accomplished by the Vitamins Plus piece. Credit: Einson-Freeman Co., Inc.

Even a lovely damsel pays for gustatorial sins, says this display, but points to the remedy "Pepto-Bismol for Upset Stomach." Center piece is accompanied by easel-mounted lithographic reproductions of the package itself. Credit: Kindred, MacLean & Co., Inc.





Using a minimum of wood and cardboard—both scarce materials when this piece was launched—Starlet Lipstick achieves effective counter appeal by a distinctive arrangement. Credit: Van Dyke-Baird.

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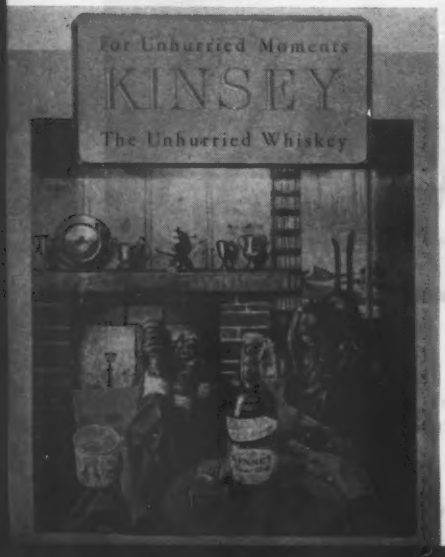
Floor dispenser for Vaughan's garden seeds presents a complete assortment convenient for customer choice. The attractively-colored rack which is 30 in. wide and 55 in. high, holds 78 varieties of the seeds. Credit: Chicago Cardboard Co.



This display provides continuity, long life and a variety of appeal. Center unit is 42 in high, provides a substantial base with shelves for product display and is surmounted by a set of 16 changeable copy panels, plastic bound. Credit: Zipprodt, Inc.



The counter basket, with its jumble display and its self-service possibilities, proves an effective sales help for Heublein's A-1 Sauce. Placed near the cash register, it acts as an impulse salesman. Credit: Consolidated Lithographing Corp.



Kinsey whiskey ties display advertising with magazine copy by reproducing John Atherton's painting in a lithographic piece which is intended for use in the windows or interiors of stores. Credit: Einson-Freeman Co.



A chemist's rack, with the addition of a little paint and a few labels, becomes a cosmetic powder tester for counter use. Ordinary test tubes hold different shades of powder, identified by blue and gold band labels. Credit: Armstrong Cork Co.



A ceramic trade figure—Seaforth's "Little General"—carries a giant-size ceramic container of McKelvy's men's toiletries. Used widely in space advertising, this trade figure makes tie-in at point of sale.

XUM

Petri
Wine



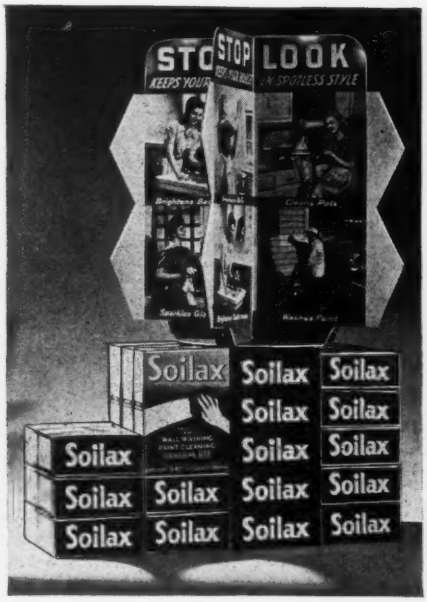
A huge recipe book, with appetizing illustrations in full color and realistic index tabs on one side, is the center of interest in this Petri Wine display. It is supplemented by actual packages and lithographic side pieces. Credit: Einson-Freeman Co., Inc.



Long identified with every type of sport, the Gillette Safety Razor Co. stopped traffic with a mechanical window display depicting two comedy boxing figures, surrounded by jumbo packages of Gillette blades. Credit: Metropolitan Mechanical Display Co.



Each year selection of the current Miss Rheingold attracts more and more voters. This display features a ballot box simulating a case of Rheingold beer, above which appear pictures of six glamourous candidates. Credit: Einson-Freeman Co.



Similar to a revolving postcard rack, the top unit in this display carries a number of pictorials illustrating product uses. Mounted on dummy packages, the rack revolves to the customer's touch, suggesting household jobs. Credit: Ketterlinus Lithographic Mfg. Co.



Tenderleaf Tea is back with a post-war floor stand. Trade-mark tea leaf in green makes contrast with brilliant red base. Display basket, filled with packages, tempts impulse sales. Dealer can feature price appeal for which there is ample space. Credit: Lutz & Scheinkman.

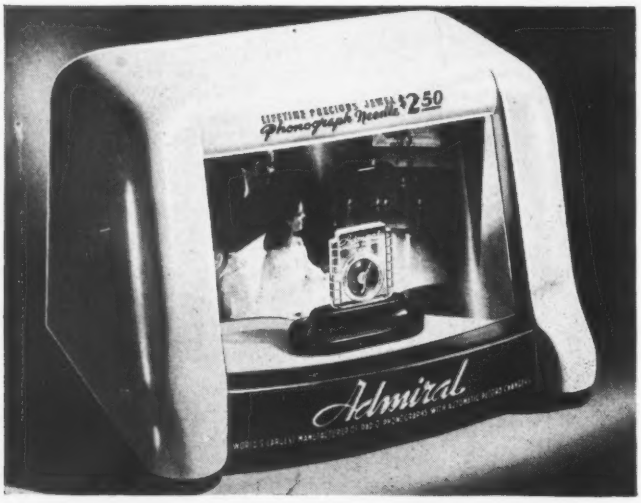
XUM



A compact, space-saving counter unit for Bright Star Batteries and Flashlights utilizes plastic material, which has a beautiful natural luster but permits complete visibility. The display piece is constructed to permit convenient means of dispensing.



Luxurious looking, yet actually moderate in expense, this permanent counter display combines plastic with wood. Little spots of color on the plastic sheath form the background for actual products which fit snugly into the wooden base. Credit: Nathaniel H. Freeman.



This display, constructed of wood, finished in ivory and black, dramatizes the "Lifetime Precious Jewel Phonograph Needle." Product is visible through a beveled glass front but contents are protected against the danger of pilferage. Credit: The Woodcraft Corp.



Burnham & Morrell's display dramatizes the cooking process of their Brick Oven Baked Beans by depicting the early New England kitchen where beans were cooked in the authentic "Down East" way. Credit: Diorama Corporation of America.



Hudnut develops a clever counter tester for powder, utilizing minimum quantity of materials—wood base, small mirror background, plastic sifter-top vials. Mirror, fitting into a groove, is removable for shipping purposes. Credit: C. L. Gregg and Celluplastic Corp.

XUM

ADVERTISING FOR MERCHANDISING DISPLAY


VICKS
SHEAFFER'S
Skrip
Rexall
JELL-O
RUMFORD
Coca-Cola
TRADE-MARK
Raleigh
Necco
ONE A DAY
DU PONT
Alka-Seltzer
"JUNKET"
TRADE-MARK
DENTYNE
SWAN
Lederle
HERCULES POWDER
HOOD
CHESTERFIELD
BAKER'S
Ball
SYLVANIA
KNOX
GELATINE
FORBES LITHOGRAPHY HAS BEEN VITALIZING AMERICAN TRADE-MARKS FOR 84 YEARS



TIME TO REVITALIZE TRADE-MARKS

- The green light of peace is again glowing in America.
- NOW is the time to recapture valuable trade-mark and trade name recognition and acceptance, lost under wartime restrictions and during the tremendous mass migrations of consumers into war's fighting and production activities.
- Now is the time to remind Americans of the value and integrity inherent in well-known trade names and trade-marks.
- A direct and efficient method of accomplishing this is to maintain these vital symbols active at points of purchase and points of use. This can be done effectively on displays, posters, booklets, folders, inserts, labels, wrappers, cartons, calendars, educational material and other lithographed items.
- We are helping others in this important merchandising work.
- We can help you, too.

FORBES LITHOGRAPH CO.

P. O. Box 513 Boston 2

NEW YORK CLEVELAND CHICAGO ROCHESTER



CHASPEC'S Unique manufacturing facilities

. Forming	. Blanking	. Embossing	. Cutting
. Combining	. Gluing	. Laminating	. Assembling
. Coating	. Spraying	. Enameling	. Finishing

MATERIALS USED

Metal Paper Wood Paperboard Masonite
Tekwood Composition Sheet Plastics Fibre

THERMOLOID (Our own specialty)

The asphaltum impregnated fibre plastic board. Thermoloid is moulded, pressed and formed in high relief dimension. In many instances it has replaced metal and plastics.

CHASPEC displays add a third dimension . . . a new realism and appeal . . . to point-of-sale merchandising.

These displays are permanent . . . designed, embossed and printed for long term salesmanship.

Whatever your needs . . . whatever your message . . . **CHASPEC'S** special process of high relief . . . **CHASPEC'S** 25 years of ingenuity in design and merchandising . . . can create a truly handsome display for your product . . . supplied in any quantity at reasonable cost.

Let us help you solve your display problems.

CHASPEC MANUFACTURING CO.

295 Lafayette St., New York 12, N. Y. Canal 6-0338



This dramatic "Johnny" pose originally reproduced at U. S. P. & L. on point-of-purchase posters for Philip Morris & Company, Ltd., Inc.

Yes, Philip Morris & Company, Ltd., Inc. calls on U. S. P. & L. to produce both advertising and packaging materials for its famous brand of Philip Morris cigarettes. Only the highest quality workmanship . . . the most dependable service . . . merit this continued "call" from Philip Morris. This prominent manufacturer of cigarettes and other tobacco products, like many other leading American companies, has discovered that "U-S" service . . . highly skilled and completely diversified . . . is the answer to exacting color reproduction requirements. Here's a tip for you, too – call for U. S. P. & L.

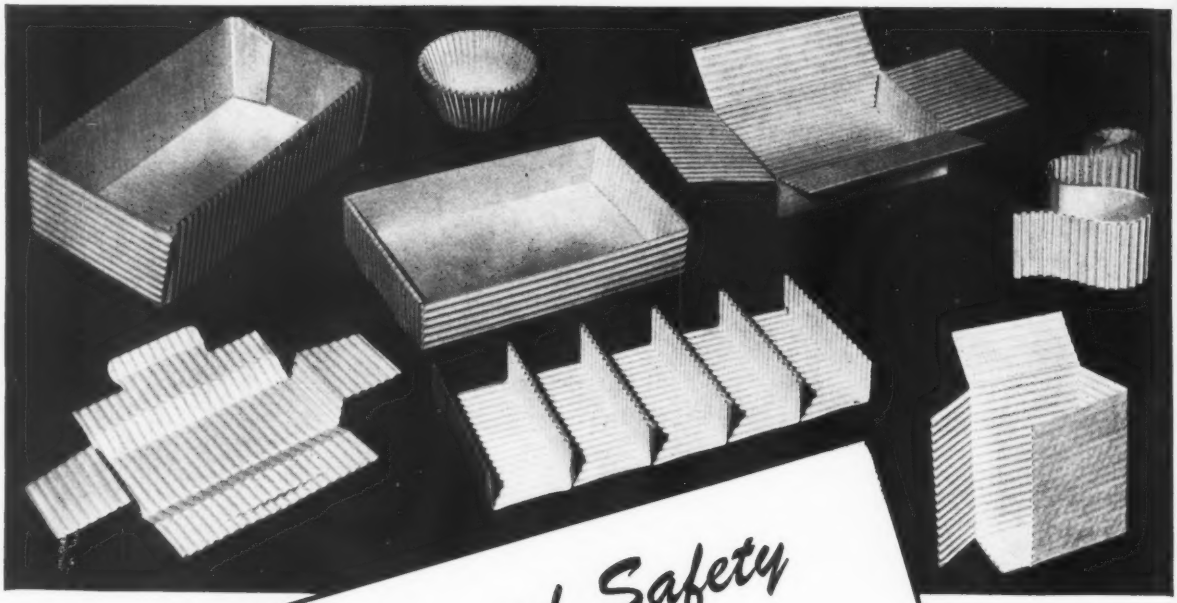
THE UNITED STATES PRINTING & LITHOGRAPH COMPANY

EXECUTIVE OFFICES • 611 BEECH ST., CINCINNATI 12, OHIO

Sales Offices in Principal Cities

5 GREAT "U-S" PLANTS PRODUCING HIGHEST QUALITY ADVERTISING AND PACKAGING MATERIALS





For Style and Safety in Packaging—Use

CORRODEK

In today's competitive scramble for markets, every part of your package must do double duty—enhancing eye appeal as well as protecting your products. The ideal answer is Corrodek! Its crisp, sparkling colors and strong, resilient corrugations provide the ideal combination to build consumer good will and greater sales.

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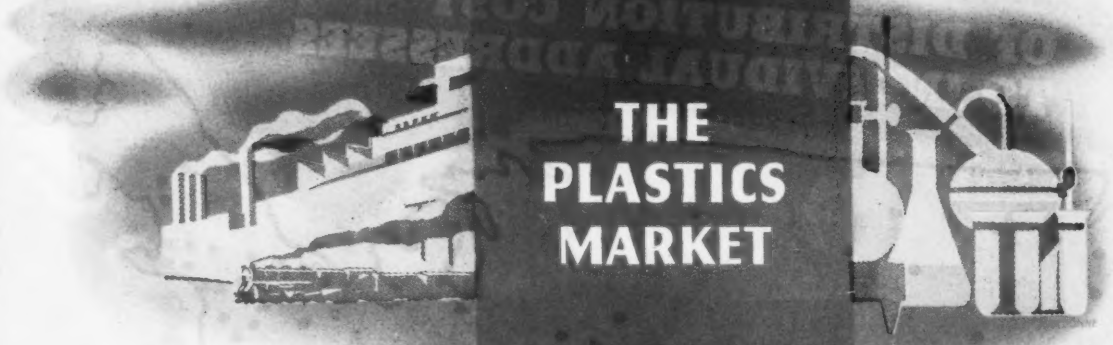
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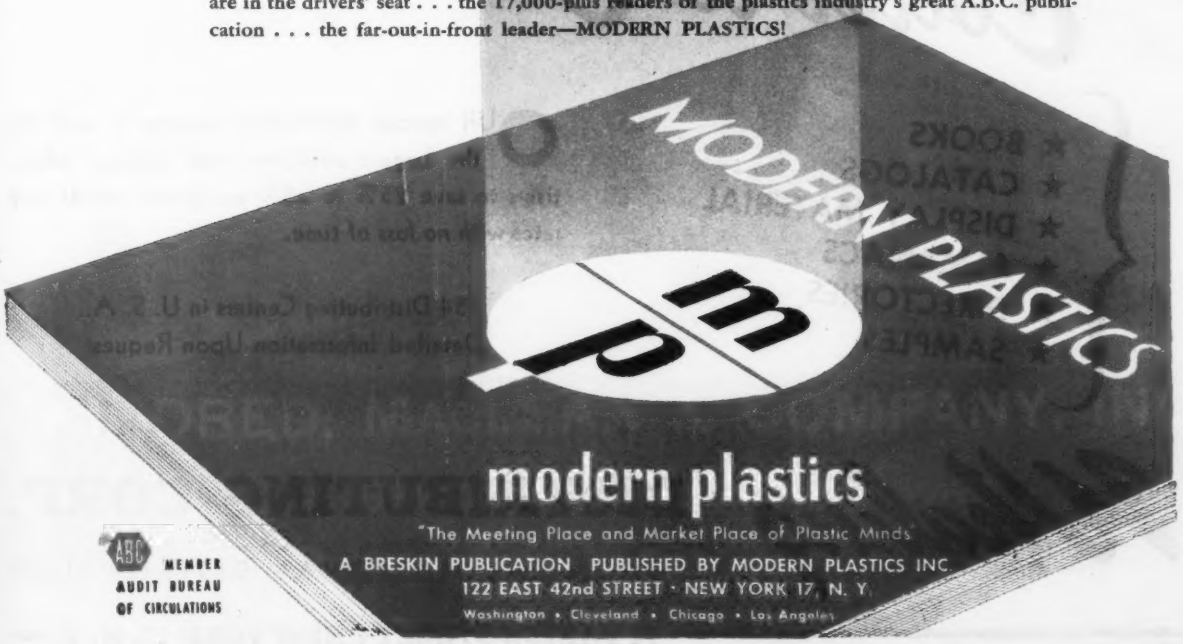
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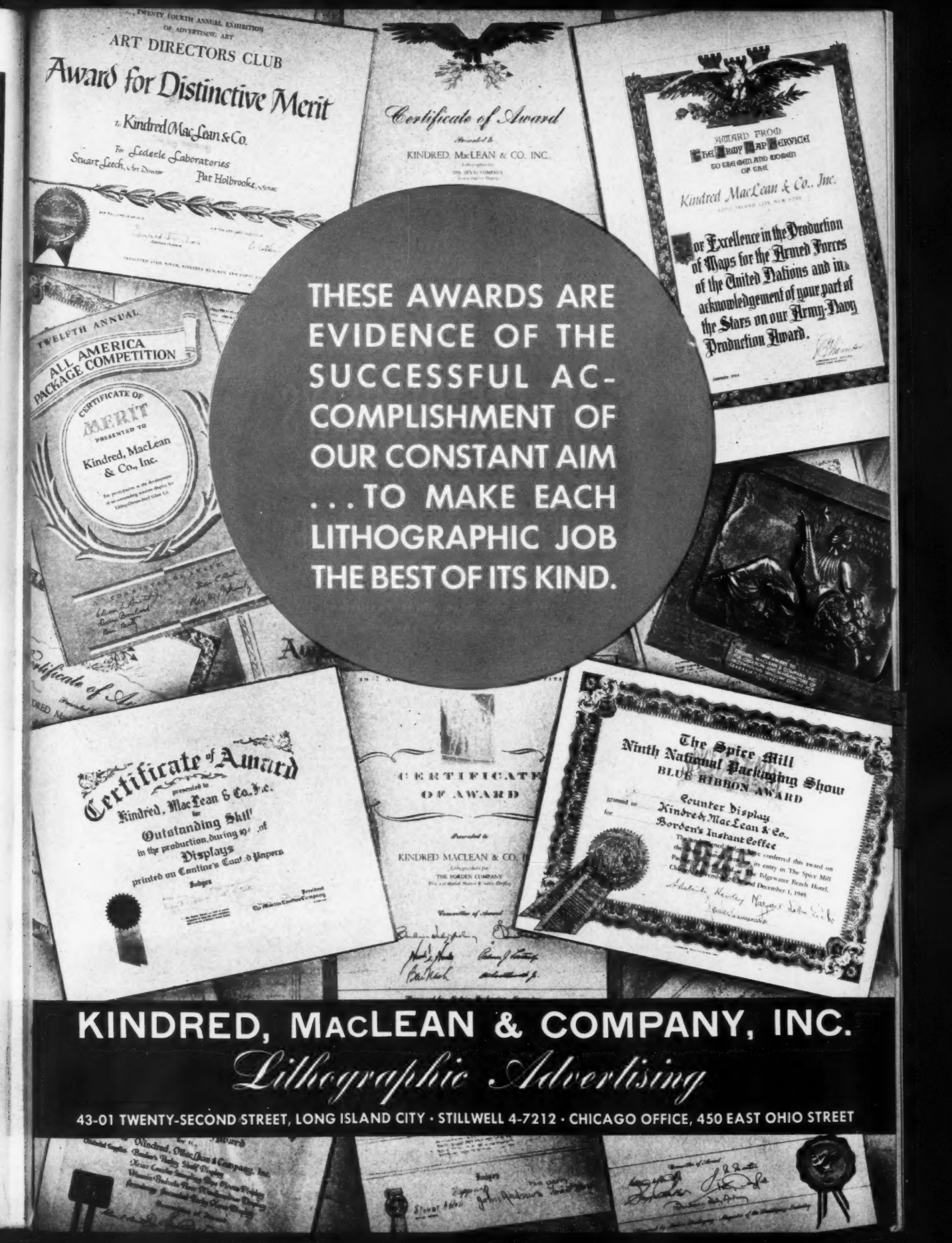
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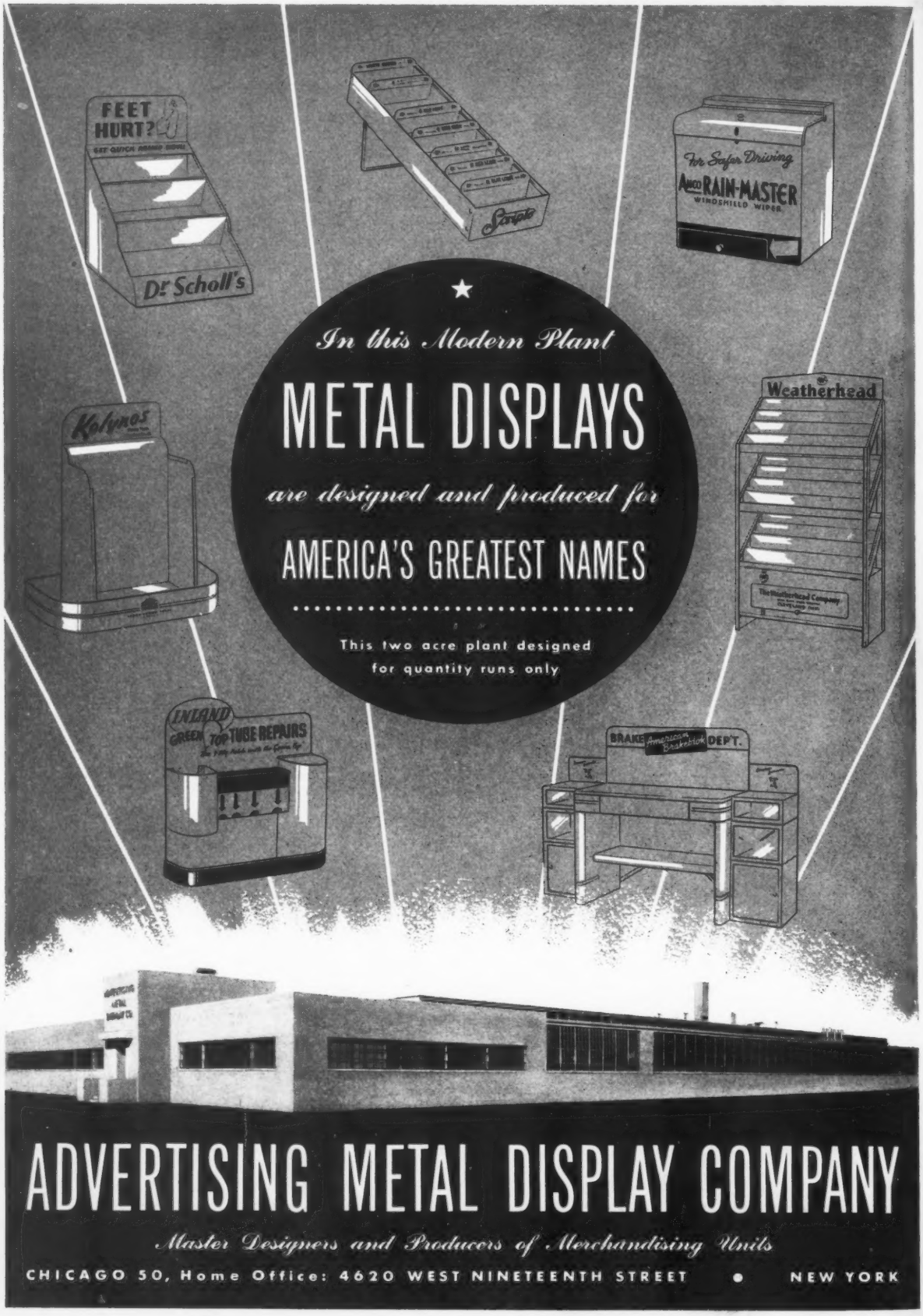


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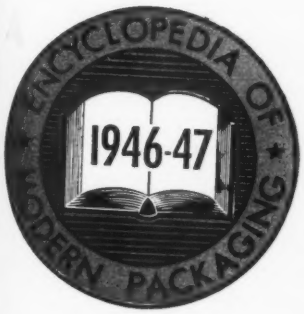
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Buyers' Directory

FOR QUICK REFERENCE:—Principal feature of this Directory of the Packaging Industry is the four section classified list of products, services and suppliers. This has several new features.

EXAMPLE OF USE:—Suppose you are seeking sources for *closure liners*. Locate "Closures" or "Liners" in the Subject Index immediately below. Refer to the page given, on which will be listed a number of sources. Street addresses may be obtained by reference to page 1022, "Alphabetical List of Manufacturers and Addresses." In all the lists, bold-face type indicates manufacturers whose advertising appears elsewhere in this book. From these advertisements additional information may be obtained about specific products or services.

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Angier Products, Inc., Cambridge, Mass.
Arabol Mfg Co., New York, N. Y.
Arvey Corp., Chicago, Ill.
Atlas Gum & Sizing Co., New York, N. Y.
Bakelite Corp., New York, N. Y.
Bingham Bros. Co., New York, N. Y.
Clark Stek-O Corp., Rochester, N. Y.
Commercial Paste Co., The, Columbus, Ohio
Dewey & Almy Chemical Co., Cambridge, Mass.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Findley, F. G. Co., The, Milwaukee, Wis.
Flood & Conklin Mfg. Co., Newark, N. J.
Goodyear Tire & Rubber Co., Akron, Ohio
Interlake Chemical Co., Cleveland, Ohio
Kelly, E. J. Co., Subsidiary, Sun Chemical Corp., Kalamazoo, Mich.
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Manhattan Paste & Glue Co., Inc., Bklyn, N. Y.
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Midland Glue Products Co., Detroit, Mich.
Mid-States Gummed Paper Co., Chicago, Ill.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
National Adhesives, New York, N. Y.
National Casein Sales, Chicago, Ill.
Naugatuck Chemical, Div. U. S. Rubber Co., New York, N. Y.
Paisley Products, Inc., Chicago, Ill.
Philadelphia Quartz Co., Phila., Pa.
Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio
Powers Products, Inc., Chicago, Ill.
Presstite Engineering Co., St. Louis, Mo.
Pyroxylin Products, Inc., Chicago, Ill.
Resinous Products & Chemical Co., The, Phila., Pa.
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Union Paste Co., Hyde Park, Mass.
U. S. Adhesives Co., Chicago, Ill.
United States Plywood Corp., New York, N. Y.
United States Rubber Co., New York, N. Y.
Williamson Adhesives, Inc., Chicago, Ill.
Zapon Div., Atlas Powder Co., Stamford, Conn.; N. Chicago, Ill.
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American Products Mfg. Co., New Orleans, La.
American Resinous Chemicals Corp., Peabody, Mass.
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Atlas Gum & Sizing Co., New York, N. Y.
Bakelite Corp., New York, N. Y.
Bingham Bros. Co., New York, N. Y.
Catalin Corp., New York, N. Y.
Chemical Plastics, Inc., Minneapolis, Minn.
Dewey & Almy Chemical Co., Cambridge, Mass.
Dow Chemical Co., The, Midland, Mich.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Durez Plastics & Chemicals, Inc., N. Tonawanda, N. Y.
Durite Plastics, Inc., Phila., Pa.
Findley, F. G. Co., The, Milwaukee, Wis.
Flood & Conklin Mfg. Co., Newark, N. J.
Glyco Products Co., Inc., Bklyn, N. Y.
Goodyear Tire & Rubber Co., Akron, Ohio
Gordon-Lacey Chemical Products Co., Inc., Maspeth, L. I., N. Y.
Industrial Tape Corp., New Brunswick, N. J.
Interlake Chemical Corp., Cleveland, Ohio
Le Page's, Gloucester, Mass.
Manhattan Paste & Glue Co., Inc., Bklyn, N. Y.
Midland Glue Products Co., Detroit, Mich.
Mid-States Gummed Paper Co., Chicago, Ill.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
National Adhesives, New York, N. Y.
National Casein Sales, Chicago, Ill.
Paisley Products, Inc., Chicago, Ill.
Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio
Powers Products, Inc., Chicago, Ill.
Pyroxylin Products Inc., Chicago, Ill.
Reilly Tar & Chemical Corp., Indianapolis, Ind.
Resinous Products & Chemical Co., The, Phila., Pa.
Rohm & Haas Co., Phila., Pa.
Stein, Hall & Co., Inc., New York, N. Y.
Sylvania Industrial Corp., New York, N. Y.
Synvar Corp., Wilmington, Del.
Union Paste Co., Hyde Park, Mass.
United States Plywood Corp., New York, N. Y.
United States Rubber Co., New York, N. Y.
Williamson Adhesives, Inc., Chicago, Ill.

* Adhesives are usually formulated for specialized applications. This is particularly true of the newer resin adhesives. The user should consult the article, "What to Tell Your Adhesives Supplier," in MODERN PACKAGING ENCYCLOPEDIA, and give full information as to your requirements and conditions of use.

APPLICATOR CLOSURES

(See Closures, Applicator)

ASPHALT COATING, HOT DIPPING, SEALING

American Resinous Chemicals Corp., Peabody, Mass.
Davison Chemical Corp., The, Baltimore, Md.
Midland Glue Products Co., Detroit, Mich.
Paisley Products, Inc., Chicago, Ill.
Presstite Engineering Co., St. Louis, Mo.
Reilly Tar & Chemical Corp., Indianapolis, Ind.
Zophar Mills, Inc., Bklyn, N. Y.

BAG TIES

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American-Natl. Bag & Burlap Co., Inc., Bklyn, N. Y.
Ames Bag Co., Cleveland, Ohio
Gump, B. F. Co., Chicago, Ill.
Kehr Paper Products Co., Phila., Pa.
Maine Potato Bag Co., Caribou, Maine
Paramount Paper Products Co., Inc., Phila., Pa.
Potdevin Machine Co., Bklyn, N. Y.
Royal, Thomas M. & Co., Phila., Pa.
St. Regis Paper Co., New York, N. Y.
Walker Bag Co., Inc., Louisville, Ky.

BOXBOARD, ASPHALT LAMINATED

Butterfield-Barry Co., Inc., The, New York, N. Y.
Consolidated Paper Co., Monroe, Mich.
Empire Box Corp., Garfield, N. J.
Fabricated Products Co., Pittsburgh, Pa.
Fibreboard Products, Inc., San Francisco, Calif.
Gardner-Richardson Co., The, Middletown, Ohio
Gaylord Container Corp., St. Louis, Mo.
Jaypaco Co., New York, N. Y.
National Water-Proofing Co., Camden, N. J.
Ohio Boxboard Co., The, Rittman, Ohio
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Rexford Paper Co., Milwaukee, Wis.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
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Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Butterfield-Barry Co., Inc., The, New York, N. Y.
Container Corp. of America, Chicago, Ill.
Eddy Paper Corp., Chicago, Ill.
Gardner-Richardson Co., The, Middletown, Ohio
Jaypaco Co., New York, N. Y.
Lowe Paper Co., Ridgefield, N. J.
National Folding Box Co., New Haven, Conn.
Ohio Boxboard Co., The, Rittman, Ohio
Ross Paper Co., New York, N. Y.
United Paperboard Co., New York, N. Y.
Waldorf Paper Products Co., St. Paul, Minn.

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Andrews, O. B. Co., Chattanooga, Tenn.
Bird & Son, Inc., E. Walpole, Mass.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Butterfield-Barry Co., Inc., The, New York, N. Y.
Carolina Paper Board Corp., Charlotte, N. C.
Carthage Paper Makers, Inc., Carthage, N. Y.
Central Fibre Products Co., Chicago, Ill.
Chemical Paper Mfg. Co., Holyoke, Mass.
Chesapeake Paperboard Co., The, Baltimore, Md.
Columbia Box Board Mills, Inc., Chatham, N. Y.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Chicago, Ill.
Continental Paper Co., Ridgefield Park, N. J.
Cornell Wood Products Co., Chicago, Ill.
Clifton Paper Board Co., Clifton, N. J.
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Eddy Paper Corp., The, Chicago, Ill.
Empire Box Corp., Garfield, N. J.
Federal Paper Board Co., Inc., Bogota, N. J.
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United Paperboard Co., New York, N. Y.
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Melind, Louis Co., Chicago, Ill.
Merchant Suppliers Paper Co., New York, N. Y.
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American Resinous Chemicals Corp., Peabody, Mass.
Ams, Max Machine Co., Bridgeport, Conn.
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Monsanto Chemical Co., Plastics Div., Springfield, Mass.
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Grigoleit Co., The, Decatur, Ill.
Hychex Products, Chicago, Ill.
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Mundet Cork Corp., Closure Div., Bklyn, N. Y.
Owens-Illinois Glass Co., Toledo, Ohio
Pennsylvania Glass Products Co., Pittsburgh, Pa.
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Schnier, I. F. Co., San Francisco, Calif.
Schutz Bros., New York, N. Y.
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Franklin Plastics Div., Robinson Industries, Inc., Franklin, Pa.

Addresses of companies listed appear on pages 1022–1033

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Armstrong Cork Co., Lancaster, Pa.
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Mundet Cork Corp., Closure Div., Bklyn, N. Y.

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Aluminum Goods Mfg. Co., Manitowoc, Wis.
Aluminum Seal Co., New Kensington, Pa.
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American Star Cork Co., Inc., Bklyn, N. Y.
Anchor Hocking Glass Corp., Lancaster, Ohio
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Art Tube Co., Inc., Irvington, N. J.
Ball Brothers Co., Muncie, Ind.
Berman Bros., Inc., Chicago, Ill.
Bernardin Bottle Cap Co., Inc., Evansville, Ind.
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Cans, Inc., Chicago, Ill.
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Western Stopper Co., Inc., San Francisco, Calif.
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Anchor Hocking Glass Corp., Lancaster, Ohio
Aridor Closure Div. of Ball Bros. Co., Chicago, Ill.
Art Tube Co., Inc., Irvington, N. J.
Crown Cork Specialty Corp., Div. of Crown Cork & Seal Co., Decatur, Ill.
Grammes, L. F. & Sons, Inc., Allentown, Pa.
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Na-Mac Products Corp., Hollywood, Calif.
National Seal Corp., Bklyn, N. Y.
Reynolds Metals Co., Richmond, Va.
Sterling Seal Co., Erie, Pa.

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Armstrong Cork Co., Lancaster, Pa.
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Berman Bros., Inc., Chicago, Ill.
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Braun, W. Co., Chicago, Ill.
Bridgeport Moulded Prods., Inc., Bridgeport, Conn.
Brockway Glass Co., Brockway, Pa.
Cleveland Plastics, Inc., Cleveland, Ohio
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
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Davies, Harry Molding Co., Chicago, Ill.
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Mundet Cork Corp., Closure Div., Bklyn, N. Y.
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Braun, W. Co., Chicago, Ill.
Crown Cork & Seal Co., Baltimore, Md.
Dewey & Almy Chemical Co., Cambridge, Mass.
Guardian Safety Seal Co., Chicago, Ill.
Gutmann, Ferdinand & Co., Bklyn, N. Y.
Hazel-Atlas Glass Co., Wheeling, W. Va.
National Seal Corp., Bklyn, N. Y.
Owens-Illinois Glass Co., Toledo, Ohio
Phoenix Metal Cap Co., Chicago, Ill.
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Bakelite Corp., New York, N. Y.
California Ink Co., Inc., The, San Francisco, Calif.
Carbide & Carbon Chemical Corp., Plastics Div., New York, N. Y.
Carlson, John P. Inc., Bklyn, N. Y.
Catalin Corp., New York, N. Y.
Chemical Color & Supply Div., Sun Chemical Corp., Chicago, Ill.
Cleaveland Lab. & Mfg. Co., Inc., Peapack, N. J.
Clover Leaf Paint & Varnish Corp., Long Island City, N. Y.
Corn Products Refining Co., New York, N. Y.
Crescent Ink & Color Co. of Penna., Phila., Pa.
Davison Chemical Corp., The, Baltimore, Md.
Dewey & Almy Chemical Co., Cambridge, Mass.
Dow Chemical Co., The, Midland, Mich.
Durez Plastics & Chemicals, Inc., N. Tonawanda, N. Y.
Durite Plastics, Inc., Phila., Pa.
Eagle Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Egyptian Lacquer Mfg. Co., The, New York, N. Y.
Fales Chemical Co., Inc., The, Cornwall Landing, N. Y.
Flint, Howard Ink Co., Detroit, Mich.
Flood & Conklin Mfg. Co., Newark, N. J.
Floquil Products, Inc., New York, N. Y.
Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
General Industrial Finishes Div., Sun Chemical Corp., New York, N. Y.
General Printing Ink Div., Sun Chemical Corp., New York, N. Y.
George, P. D. Co., The, St. Louis, Mo.
Goodrich, B. F. Co., The, Akron, Ohio
Goodyear Tire & Rubber Co., Akron, Ohio
Gordon-Lacey Chemical Products Co., Inc., Maspeth, L. I., N. Y.
Heresite & Chemical Co., Manitowoc, Wis.
Huber, J. M. Inc., New York, N. Y.
Interlake Chemical Corp., Cleveland, Ohio
International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Interstate Folding Box Co., Middletown, Ohio
Lauxite Corp., Lockport, N. Y.
Levey, Fred'k H. Co., Inc., New York, N. Y.
Maas & Waldstein Co., Newark, N. J.
Marathon Corp., Menasha, Wis.
Marblette Corp., The, Long Island City, N. Y.
Midland Glue Products Co., Detroit, Mich.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Morrill, Geo. H. Div., Sun Chemical Corp., New York, N. Y.
National Adhesives, New York, N. Y.
National Oil Products Co., Harrison, N. J.
National Waterproofing Co., Camden, N. J.
Naugatuck Chemical, Div. of U. S. Rubber Co., New York, N. Y.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Paragon Plastics, Inc., Seattle, Wash.
Philadelphia Quartz Co., Phila., Pa.
Plastic Coating Corp., Holyoke, Mass.
Plastics Finishing Corp., Bklyn, N. Y.
Pope & Gray, Inc., New York, N. Y.
Powers Products, Inc., Chicago, Ill.
Presstite Engineering Co., St. Louis, Mo.
Protective Coatings Corp., Belleville, N. J.
Protective Coatings, Inc., Detroit, Mich.
Pyrotex Leather Co., Leominster, Mass.
Pyroxylin Products, Inc., Chicago, Ill.
Reilly Tar & Chemical Corp., Indianapolis, Ind.
Roberts, Lewis Inc., Newark, N. J.
Roosen, H. D. Co., Bklyn, N. Y.
Sinclair & Valentine Co., New York, N. Y.
Sleight Metallic Ink Co., Phila., Pa.
Sun Chemical Corp., New York, N. Y.
Ullman, Sigmund Div., Sun Chemical Corp., Bronx, N. Y.
Union Carbide & Carbon Corp., New York, N. Y.
U. S. Finishing & Mfg. Co., Chicago, Ill.
United States Rubber Co., New York, N. Y.
Watson-Standard Co., The, Pittsburgh, Pa.
Wills & Roberts Plastics Mfg. Corp., Pasadena, Calif.
Zapon Div., Atlas Powder Co., Stamford, Conn.; N. Chicago, Ill.
Zophar Mills, Inc., Bklyn, N. Y.

COATINGS, PROTECTIVE, REMOVABLE

(Strip Type)

American Anode Inc., Akron, Ohio
American Resinous Chemicals Corp., Peabody, Mass.
Angier Products, Inc., Cambridge, Mass.
Ault & Wiborg Div., Interchemical Corp., Cincinnati, Ohio
Babbitt Chemical Specialties Co., New York, N. Y.
Bakelite Corp., New York, N. Y.
Bischoff, Ernst Co., Inc., New York, N. Y.
Dow Chemical Co., The, Midland, Mich.
Glidden Co., Cleveland, Ohio
Gordon-Lacey Chemical Prods. Co., Inc., Maspeth, L. I., N. Y.
Hercules Powder Co., Inc., Wilmington, Del.
Houghton, E. F. Co., Phila., Pa.
International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Jones Dabney Co., Louisville, Ky.
Nox-Rust Corp., Chicago, Ill.
Paisley Products, Inc., Chicago, Ill.
Pontiac Varnish Co., Pontiac, Mich.
Presstite Engineering Co., St. Louis, Mo.
Protective Coating Corp., Belleville, N. J.
Pyroxylin Products, Inc., Chicago, Ill.
Seibert Varnish Co., Detroit, Mich.
Sylvania Industrial Corp., New York, N. Y.
United States Rubber Co., New York, N. Y.
Wills & Roberts Plastics Mfg. Co., Pasadena, Calif.
Witco Chemicals Co., Chicago, Ill.
Zapon Div., Atlas Powder Co., Stamford, Conn.; N. Chicago, Ill.
Zophar Mills, Inc., Bklyn, N. Y.

CORD, CELLULOSE

Fibre Cord Co., New York, N. Y.
Southern Plastics Co., Columbia, S. C.

CORK SHEETS

(Paper-Backed)

Armstrong Cork Co., Lancaster, Pa.
Mundet Cork Corp., Closure Div., Bklyn, N. Y.

CORKS

American Star Cork Co., Inc., Bklyn, N. Y.
Armstrong Cork Co., Lancaster, Pa.
Berman Bros., Inc., Chicago, Ill.
Continental Can Co., Inc., New York, N. Y.
Dodge Cork Co., Inc., Lancaster, Pa.
Mundet Cork Corp., Closure Div., Bklyn, N. Y.

CORKS, ALUMINUM TOP

Armstrong Cork Co., Lancaster, Pa.
Consolidated Fruit Jar Co., New Brunswick, N. J.
Dodge Cork Co., Inc., Lancaster, Pa.
Mundet Cork Corp., Closure Div., Bklyn, N. Y.

CORKS, MOLDED TOP

Armstrong Cork Co., Lancaster, Pa.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site Plastics Div., E. S. Lowe Co., Inc., Paterson, N. J.

Dodge Cork Co., Inc., Lancaster, Pa.
Michigan Molded Plastics, Inc., Dexter, Mich.
Molded Insulation Co., Phila., Pa.
Mundet Cork Corp., Closure Div., Bklyn, N. Y.

CORKS, WOOD TOP

American Star Cork Co., Inc., Bklyn, N. Y.
Armstrong Cork Co., Lancaster, Pa.
Dodge Cork Co., Inc., Lancaster, Pa.
Mundet Cork Corp., Closure Div., Bklyn, N. Y.
Schutz Bros., New York, N. Y.

DAUBERS

(See Closures, Applicator)

DECALCOMANIA TRANSFERS

American Decalcomania Co., Chicago, Ill.
Foxon Co., The, Providence, R. I.
Howell, F. M. & Co., Elmira, N. Y.
Kaumagraph Co., Wilmington, Del.
Meyercord Co., The, Chicago, Ill.
Palm Bros. Decalcomania Co., The, Cincinnati, Ohio
Palm, Fechteler & Co., New York, N. Y.
Process Displays, Inc., Milwaukee, Wis.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Talmadge Printing Co., New York, N. Y.
Universal Ceramics Corp., New York, N. Y.

DESICCANTS, DEHYDRATING AGENTS

Davison Chemical Corp., The, Baltimore, Md.
Filtrol Corp., Los Angeles, Calif.
Joliet Chemicals, Ltd., Joliet, Ill.

DROPPERS, BOTTLE

Anchor Hocking Glass Corp., Lancaster, Ohio
Armstrong Cork Co., Lancaster, Pa.
Berman Bros., Inc., Chicago, Ill.
Braun, W. Co., Chicago, Ill.
Brockway Glass Co., Inc., Brockway, Pa.
Glass Industries, Inc., New York, N. Y.
Kimble Glass Co., Vineland, N. J.
Owens-Illinois Glass Co., Toledo, Ohio
Pennsylvania Glass Products Co., Pittsburgh, Pa.
Sager Bros., New York, N. Y.

EXCELSIOR, PAPER

(See also Paper, Excelsior and Shredded)

American Excelsior Corp., Chicago, Ill.
Blake, Moffitt & Towne, San Francisco, Calif.
Daniels Mfg. Co., Rhinelander, Wis.
Detroit Sulphite Pulp & Paper Co., Detroit, Mich.
Dunn Sulphite Paper Co., Port Huron, Mich.
Erving Paper Mills, Erving, Mass.
Excelsior Paper Specialties Co., New York, N. Y.
Shamrock Co., The, St. Louis, Mo.
Specialty Papers Co., Dayton, Ohio
Sweetnam, Geo. H. Inc., Cambridge, Mass.
Sylvania Industrial Corp., New York, N. Y.
Twitchell, E. W. Inc., Pkg. Div., Phila., Pa.
Western Waxed Paper Co., Los Angeles, Calif.

FILTERS

Corning Glass Works, Corning, N. Y.
Kiefer, Karl Machine Co., Cincinnati, Ohio
Scientific Filter Co., New York, N. Y.

FLOCK

Claremont Waste Mfg. Co., Claremont, N. H.
Kaplan Products & Textiles, Inc., New York, N. Y.
Rayon Processing Co. of R. I., Central Falls, R. I.

FOIL, COATED, LAMINATED, ETC.

Acme Backing Corp., Bklyn, N. Y.
Arvey Corp., Chicago, Ill.
Bradner Smith & Co., Chicago, Ill.
Brown-Bridge Mills, Inc., The, Troy, Ohio
Bulkley, Dunton & Co., Inc., New York, N. Y.
Cleaveland Lab. & Mfg. Co., Inc., Peapack, N. J.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dobeckmun Co., The, Cleveland, Ohio
General Felt Products, Div. Standard Cap & Seal Corp., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Holes, Floyd A. Co., The, Bedford, Ohio
Johnston Tin Foil & Metal Co., The, St. Louis, Mo.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Keller-Dorian Corp., New York, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Marathon Corp., Menasha, Wis.
Matthias Paper Corp., Phila., Pa.
Merchant Suppliers Paper Co., New York, N. Y.
Miller Paper Co., New York, N. Y.
Milprint, Inc., Milwaukee, Wis.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Pollock Paper & Box Co., Dallas, Texas
Reynolds Metals Co., Richmond, Va.
Riegel Paper Corp., New York, N. Y.
Shellmar Products Corp., Mt. Vernon, Ohio
Shopsin Paper Co., New York, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.

FOIL, METAL

(See also Paper Foil)

Aluminum Co. of America, Pittsburgh, Pa.
Johnston Tin Foil & Metal Co., The, St. Louis, Mo.
Reynolds Metals Co., Richmond, Va.

GLASS, ROD & TUBING

Armstrong Cork Co., Lancaster, Pa.
Corning Glass Works, Corning, N. Y.
Kimble Glass Co., Vineland, N. J.
Pennsylvania Glass Products Co., Pittsburgh, Pa.

GLUES & PASTES

(See Adhesives)

INKS, MARKING & STENCIL

Bensing Bros. & Deeney, Phila., Pa.
Braden Sutphin Ink Co., Cleveland, Ohio
California Ink Co., Inc., The, San Francisco, Calif.
Cushman & Denison Mfg. Co., New York, N. Y.
Diagraph-Bradley Stencil Machine Corp., St. Louis, Mo.
Flint, Howard Ink Co., Detroit, Mich.
Floquil Products, Inc., New York, N. Y.
Force, Wm. A. & Co., Inc., Bklyn, N. Y.
Gottscho, Adolph Inc., New York, N. Y.
Ideal Stencil Machine Co., Belleville, Ill.
International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Kaumagraph Co., Wilmington, Del.
Kelly, E. J. Co., Kalamazoo, Mich.
Markem Machine Co., Keene, N. H.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Melind, Louis Co., Chicago, Ill.
Merchant Suppliers Paper Co., New York, N. Y.
Noble & Westbrook Mfg. Co., The, E. Hartford, Conn.
Powers Products, Inc., Chicago, Ill.
Roosen, H. D. Co., Bklyn, N. Y.
Schwarm & Jacobus Co., The, Cincinnati, Ohio
Sinclair & Valentine Co., New York, N. Y.
Sun Chemical Corp., New York, N. Y.
Superior Marking Equipment, Chicago, Ill.
Superior Type Co., The, Chicago, Ill.

INKS, PRINTING
(All Types)

Acme Printing Ink Co., Chicago, Ill.
American Printing Ink Div., Sun Chemical Corp., Chicago, Ill.
Auld, Hampton, Inc., Newark, N. J.
Barta-Griffin Co., Worcester, Mass.
Bensing Bros. & Deeney, Phila., Pa.
Braden Sutphin Ink Co., Cleveland, Ohio
California Ink Co., Inc., The, San Francisco. Calif.
Capitol Printing Ink Co., Inc., Washington. D. C.
Carlson, John P. Inc., Bklyn, N. Y.
Chemical Color & Supply Div., Sun Chemical Corp., Chicago, Ill.
Crescent Ink & Color Co.of Penn., Phila., Pa.
Driscoll, Martin & Co., Chicago, Ill.
Eagle Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Flint, Howard Ink Co., Detroit, Mich.
Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Gaetjens, Berger & Wirth, Inc., Bklyn, N. Y.
General Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Grady & Neary Co., Chicago, Ill.
Hellmuth, Charles Printing Ink Corp., New York, N. Y.
Hill-Hentschel Co., St. Louis, Mo.
Hilton-Davis Co., Cincinnati, Ohio.
Huber, J. M. Inc., New York, N. Y.
International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Johnson, Chas. Eneu & Co., Phila., Pa.
Kelly, E. J. Co., Subsidiary, Sun Chemical Corp., Kalamazoo, Mich.
Kohn & Madden Printing Ink Co., Chicago, Ill.
Levey, Fred'k H. Co., New York, N. Y.
Manufacturers Printing Ink Corp., Bklyn. N. Y.
Morrill, Geo. H. Div., Sun Chemical Corp., New York, N. Y.
Pacific Printing Ink Co., San Francisco. Calif.
Pope & Gray, Inc., New York, N. Y.
Roberts, Lewis Inc., Newark, N. J.
Roosen, H. D. Co,. Bklyn, N. Y.
Rotogravure Div., Sun Chemical Corp., New York, N. Y.
Schwarm & Jacobus Co., The, Cincinnati, Ohio
Siebold, J. H. & G. B. Inc., New York, N. Y.
Sinclair & Carroll Co., New York, N. Y.
Sinclair & Valentine Co., New York, N. Y.
Sleight Metallic Ink Co., Phila., Pa.
Sun Chemical Corp., New York, N. Y.
Superior Printing Ink Co., Inc., New York. N. Y.

Bold-face listings indicate advertisers in this issue

Triangle Ink & Color Co., Inc., Bklyn, N. Y.
Ullman, Sigmund Div., Sun Chemical Corp., Bronx, N. Y.
Wilson, W. D. Printing Ink Co., Long Island City, N. Y.

LABELS, FOIL

American Colortype Co., Chicago, Ill.
Andersen, A. J., Chicago, Ill.
Attleboro Printing & Embossing Co., Attleboro, Mass.
Avery Adhesives, Los Angeles, Calif.
Bartlett Label Co., Kalamazoo, Mich.
Cameo Die & Label Co., New York, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio
Cleaveland Labs. & Mfg. Co., Peapack, N. J.
Craftsman Label Co., New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Epsen Lithographing Co., Omaha, Neb.
Ever Ready Label Corp., New York, N. Y.
Fenton Label Co., Phila., Pa.
Fleming-Potter Co., Peoria, Ill.
Foxon Co., The, Providence, R. I.
French-Bray Printing Co., Baltimore, Md.
Grand Rapids Label Co., Grand Rapids, Mich.
Holes, Floyd A. Co., The, Bedford, Ohio
Johnston Tin Foil & Metal Co., The, St. Louis, Mo.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Kaumagraph Co., Wilmington, Del.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Krause, Richard M. Inc., New York, N. Y.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Makdon Co., New York, N. Y.
McCoy Label Co., San Francisco, Calif.
Miller & Miller, Atlanta, Ga.
Milprint, Inc., Milwaukee, Wis.
Milwaukee Label & Seal Co., Milwaukee, Wis.
Nalco, Inc., New York, N. Y.
Nevins-Church Press, The, New York, N. Y.
Pacific Label Co., Los Angeles, Calif.
Pollock Paper & Box Co., Dallas, Texas
Reynolds Metals Co., Richmond, Va.
Robinson Tag & Label Co., New York, N. Y.
St. Louis Sticker Co., St. Louis, Mo.
Schmidt, Henry & Bro., Inc., Phila., Pa.
Shellmar Products Corp., Mt. Vernon, Ohio
Shuman, Frank G. Co., The, Chicago, Ill.
Tablet & Ticket Co., The, Chicago, Ill.
Talmadge Printing Co., New York, N. Y.
Tompkins' Label Service, Phila., Pa.
Unique Printed Products Co., Terre Haute, Ind.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Wheeler-Van Label Co., Grand Rapids, Mich.
Wynekoop, Walker Co., Chicago, Ill.

LABELS, HEAT SEAL

Bartlett Label Co., Kalamazoo, Mich.
Central Ohio Paper Co., The, Columbus, Ohio
Cleaveland Labs. & Mfg. Co., Peapack, N. J.
Crocker-Union, San Francisco, Calif.
Cupples-Hesse Corp., St. Louis, Mo.
Dennison Mfg. Co., Framingham, Mass.
Epsen Lithographing Co., Omaha, Neb.
Fenton Label Co., Phila., Pa.
Fitzhugh, Wm. W. Inc., New York, N. Y.
Foxon Co., The, Providence, R. I.
Grand Rapids Label Co., Grand Rapids, Mich.
Hayden, E. J. & Co., Inc., New York, N. Y.
Johnston Tin Foil & Metal Co., The, St. Louis, Mo.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Marathon Corp., Menasha, Wis.
Miller & Miller, Atlanta, Ga.
Milwaukee Label & Seal Co., Milwaukee, Wis.
Oliver Machinery Co., Pkg. Div., Grand Rapids, Mich.
Oxford Paper Co., New York, N. Y.
Robinson Tag & Label Co., New York, N. Y.
St. Louis Sticker Co., St. Louis, Mo.
Sale Lithograph Co., Buffalo, N. Y.
Shuman, Frank G. Co., The, Chicago, Ill.
Tompkins' Label Service, Phila., Pa.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
Unique Printed Products Co., Terre Haute, Ind.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.

LABELS, HEAT SEALING

(Roll Type)

Central Ohio Paper Co., The, Columbus, Ohio
Crocker-Union, San Francisco, Calif.
Cupples-Hesse Corp., St. Louis, Mo.
Dennison Mfg. Co., Framingham, Mass.
Epsen Lithographing Co., Omaha, Neb.
Fenton Label Co., Phila., Pa.
Foxon Co., The, Providence, R. I.
Marathon Corp., Menasha, Wis.
Miller & Miller, Atlanta, Ga.
Oliver Machinery Co., Pkg. Div., Grand Rapids, Mich.
Oxford Paper Co., New York, N. Y.
Tompkins' Label Service, Phila., Pa.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.

LABELS, PRESSURE SENSITIVE

(Self-Adhesive)

Avery Adhesives, Los Angeles, Calif.
Cleaveland Labs. & Mfg. Co., Peapack, N. J.
Dennison Mfg. Co., Framingham, Mass.
Epsen Lithographing Co., Omaha, Neb.
Ever Ready Label Corp., New York, N. Y.
Reynolds Metals Co., Richmond, Va.
Robinson Tag & Label Co., New York, N. Y.
Simon Adhesive Products Corp., New York, N. Y.

LABELS, ROLL TYPE

(For Shipping, Marking, Etc.)

Avery Adhesives, Los Angeles, Calif.
Bartlett Label Co., Kalamazoo, Mich.
Dennison Mfg. Co., Framingham, Mass.
Detroit Label Co., Detroit, Mich.
Epsen Lithographing Co., Omaha, Neb.
Ever Ready Label Corp., New York, N. Y.
Fenton Label Co., Phila., Pa.
Grand Rapids Label Co., Grand Rapids, Mich.
Gummed Tape & Devices Co., Bklyn, N. Y.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Krause, Richard M. Inc., New York, N. Y.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Miller & Miller, Atlanta, Ga.
Nalco, Inc., New York, N. Y.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Oliver Machinery Co., Pkg. Div., Grand Rapids, Mich.
Rexford Paper Co., Milwaukee, Wis.
Robinson Tag & Label Co., New York, N. Y.
Shuman, Frank G. Co., The, Chicago, Ill.
Talmadge Printing Co., New York, N. Y.
Tompkins' Label Service, Phila., Pa.
Unique Printed Products Co., Terre Haute, Ind.

LABELS, SHIPPING

Bartlett Label Co., Kalamazoo, Mich.
Dennison Mfg. Co., Framingham, Mass.
Detroit Label Co., Detroit, Mich.
Epsen Lithographing Co., Omaha, Neb.
Eureka Specialty Printing Co., Scranton, Pa.
Ever Ready Label Corp., New York, N. Y.
Fenton Label Co., Phila, Pa.
Glue Fast Equipment Co., Inc., New York, N. Y.
Grand Rapids Label Co., Grand Rapids, Mich.
Gummed Tape & Devices Co., Bklyn, N. Y.
Howell, F. M. & Co., Elmira, N. Y.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Magill-Weinsheimer Co., Chicago, Ill.
Market Printing Co., Chicago, Ill.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
McCoy Label Co., San Francisco, Calif.
Miller & Miller, Atlanta, Ga.
Milwaukee Label & Seal Co., Milwaukee, Wis.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Pictorial Paper Package Corp., Aurora, Ill.
Reyburn Mfg. Co., Inc., The, Phila., Pa.
Robinson Tag & Label Co., New York, N. Y.
St. Louis Sticker Co., St. Louis, Mo.
Sears, Merle Paper Box Co., Danville, Ill.
Shawprint Inc., Lowell, Mass.
Shuman, Frank G. Co., The, Chicago, Ill.
Sterling Offset Co., New York, N. Y.
Tablet & Ticket Co., The, Chicago, Ill.
Talmadge Printing Co., New York, N. Y.
Tompkins' Label Service, Phila., Pa.
Unique Printed Products Co., Terre Haute, Ind.
Wheeler-Van Label Co., Grand Rapids, Mich.

LABELS, STOCK

Bartlett Label Co., Kalamazoo, Mich.
Central Ohio Paper Co., The, Columbus, Ohio
Consolidated Litho. Corp., Bklyn, N. Y.
Crocker-Union, San Francisco, Calif.
Dennison Mfg. Co., Framingham, Mass.
Empire Lithographing Co., Inc., New York, N. Y.
Epsen Lithographing Co., Omaha, Neb.
Eureka Specialty Printing Co., Scranton, Pa.
Ever Ready Label Corp., New York, N. Y.
Fenton Label Co., Phila., Pa.
Gamse Lithographing Co., Inc., Baltimore Md.
Independent Lithograph Co., San Francisco, Calif.
Kaumagraph Co., Wilmington, Del.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Lehmann Printing & Lithographing Co., San Francisco, Calif.
Market Printing Co., Chicago, Ill.
McCoy Label Co., San Francisco, Calif.
Michigan Lithographing Co., Grand Rapids, Mich.
Miller & Miller, Atlanta, Ga.
Milwaukee Label & Seal Co., Milwaukee, Wis.
Muirson Label Co., Inc., Bklyn, N. Y.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
National Color Printing Co., Inc., Baltimore, Md.
Reyburn Mfg. Co., Inc., Phila., Pa.
Roesch, Louis Co., San Francisco, Calif.
Roman, Martin L. Co., The, New York, N. Y.

Schmidt Lithograph Co., San Francisco, Calif.
Sears, Merle Paper Box Co., Danville, Ill.
Shawprint Inc., Lowell, Mass.
Shuman, Frank G. Co., The, Chicago, Ill.
Simpson & Doeller Co., The, Baltimore, Md.
Sterling Offset Co., New York, N. Y.
Strobridge Lithographing Co., The, Cincinnati, Ohio
Tablet & Ticket Co., The, Chicago, Ill.
Talmadge Printing Co., New York, N. Y.
Tompkins' Label Service, Phila., Pa.
Trautmann, Bailey & Blampey, New York, N. Y.
Unique Printed Products Co., Terre Haute, Ind.
U. S. Printing & Lithograph Co., The, Norwood, Cincinnati, Ohio.
Waddill Printing & Lithographing Co., Danville, Va.
Wheeler-Van Label Co., Grand Rapids, Mich.

LABELS, TRANSPARENT

Bartlett Label Co., Kalamazoo, Mich.
Cellulose Packaging Corp., New York, N. Y.
Cupples-Hesse Corp., St. Louis, Mo.
Crystal Tube Corp., Chicago, Ill.
Dennison Mfg. Co., Framingham, Mass.
Dobeckmun Co., The, Cleveland, Ohio
Epsen Lithographing Co., Omaha, Neb.
Ever Ready Label Corp., New York, N. Y.
Foxon Co., The, Providence, R. I.
Hayden, E. J. & Co., Inc., New York, N. Y.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Miller & Miller, Atlanta, Ga.
Milprint, Inc., Milwaukee, Wis.
Milwaukee Label & Seal Co., Milwaukee, Wis.
Pacific Label Co., Los Angeles, Calif.
Palm, Fechteler & Co., New York, N. Y.
Palographia Co., The, New York, N. Y.
Price, M. B. Associates, New York, N. Y.
Robinson Tag & Label Co., New York, N. Y.
Roto-Lith Ltd., New York, N. Y.
Royal, Thomas M. & Co., Phila., Pa.
St. Louis Sticker Co., St. Louis, Mo.
Shellmar Products Corp., Mt. Vernon, Ohio
Unique Printed Products Co., Inc., Terre Haute, Ind.

LABELS, WATER-RESISTANT

Avery Adhesives, Los Angeles, Calif.
Central Ohio Paper Co., The, Columbus, Ohio
Cleaveland Labs. & Mfg. Co., Peapack, N. J.
Dennison Mfg. Co., Framingham, Mass.
Epsen Lithographing Co., Omaha, Neb.
Ever Ready Label Corp., New York, N. Y.
Fenton Label Co., Phila., Pa.
Kaumagraph Co., Wilmington, Del.
Kelly, E. J. Co., Subsidiary, Sun Chemical Corp., Kalamazoo, Mich.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Reynolds Metals Co., Richmond, Va.
Royal, Thomas M. & Co., Phila., Pa.
Shuman, Frank G. Co., The, Chicago, Ill.
Wheeler-Van Label Co., Grand Rapids, Mich.
Western Waxed Paper Co., Los Angeles, Calif.

LABELS & WRAPPERS, PRINTED, LITHOGRAPHED & EMBOSSED

Addison Lithographing Co., Rochester, N. Y.
American Colortype Co., Chicago, Ill.
Andersen, A. J., Chicago, Ill.
Anderson, Geo. W. Inc., Long Island City, N. Y.
Bartlett Label Co., Kalamazoo, Mich.
Bisler, G. A. Inc., Phila., Pa.
Brandau-Craig-Dickerson Co., Nashville, Tenn.
Brooks Bank Note Co., Springfield, Mass.
Burnet, R. L. Co., San Antonio, Texas
Burt, F. N. Co., Inc., Buffalo, N. Y.
Calvert Lithographing Co., Detroit, Mich.
Cambridge Paper Box Co., Cambridge, Mass.
Cameo Die & Label Co., New York, N. Y.
Central Lithograph Co., The, Cleveland, Ohio
Central Ohio Paper Co., The, Columbus, Ohio
Chaspec Mfg. Co., New York, N. Y.
Clarvan Corp., Milwaukee, Wis.
Consolidated Lithographing Corp., Bklyn, N. Y.
Courier Journal Job Printing Co., Louisville, Ky.
Craftsman Label Co., New York, N. Y.
Crocker-Union, San Francisco, Calif.
Cupples-Hesse Corp., St. Louis, Mo.
Daniels Mfg. Co., Rhinelander, Wis.
Dennison Mfg. Co., Framingham, Mass.
Detroit Label Co., Detroit, Mich.
Dixie Wax Paper Co., Dallas, Texas
Economy Novelty & Printing Co., New York, N. Y.
Edwards & Deutsch Lithographing Co., Chicago, Ill.
Empire Lithographing Co., Inc., New York, N. Y.
Epsen Lithographing Co., Omaha, Neb.
Eureka Specialty Printing Co., Scranton, Pa.
Ever Ready Label Corp., New York, N. Y.
Fitzhugh, Wm. W. Inc., New York, N. Y.
Fleming-Potter Co., Peoria, Ill.
Forbes Lithograph Mfg. Co., Boston, Mass.
Foxon Co., The, Providence, R. I.
French-Bray Printing Co., Baltimore, Md.
Gamse Lithographing Co., Inc., Baltimore, Md.
Genesee Valley Lithograph Co., Inc., Rochester, N. Y.
Globe Paper Box Co., Chicago, Ill.
Grace, Tom W. Co., Dallas, Texas
Grand Rapids Label Co., Grand Rapids, Mich.
Heaphy, Charles F. Co., New York, N. Y.
Heminway Corp., Waterbury, Conn.
Howell, F. M. & Co., Elmira, N. Y.
Independent Lithograph Co., San Francisco, Calif.
Johnston Tin Foil & Metal Co., The, St. Louis, Mo.
Kaumagraph Co., Wilmington, Del.
Kindred, MacLean & Co., Inc., Long Island City, N. Y.
Krause, Richard M. Inc., New York, N. Y.
Lambooy Label & Wrapper Co., Kalamazoo, Mich.
Lehman Printing & Lithographing Co., San Francisco, Calif.,
Lord Baltimore Press, New York, N. Y.
Lutz & Sheinkman, New York, N. Y.
Magill-Weinsheimer Co., Chicago, Ill.
Makdon Co., New York, N. Y.
Market Printing Co., Chicago, Ill.
McCoy Label Co., San Francisco, Calif.
Michigan Lithographing Co., The, Grand Rapids, Mich.
Miller & Miller, Atlanta, Ga.
Milprint, Inc., Milwaukee, Wis.
Milwaukee Label & Seal Co., Milwaukee, Wis.
Muirson Label Co., Inc., Bklyn, N. Y.
Nalco, Inc., New York, N. Y.
Nashua Package Sealing Co., Inc., Nashua, N. H.
National Color Printing Co., Inc., The, Baltimore, Md.
National Process Co., New York, N. Y.
Nevins-Church Press, New York, N. Y.
Oberly & Newell Lithograph Corp., New York, N. Y.
Pacific Label Co., Los Angeles, Calif.
Penn Lithographing Co., Phila., Pa.
Philipp Lithographing Co., Milwaukee, Wis.
Pictorial Paper Package Corp., Aurora, Ill.
Plastic Coating Corp., The, Holyoke, Mass.
Progress Lithographing Co., The, Cincinnati, Ohio
Rainbow Lithographing Co., The, Cincinnati, Ohio
Reed Tissues Corp., Little Falls, N. Y.
Reynolds Metals Co., Richmond, Va.
Rode & Brand, New York, N. Y.
Roesch, Louis Co., San Francisco, Calif.
Roman, Martin L. Co., The, New York, N. Y.
Rossotti Lithographing Co., Inc., N. Bergen, N. J.
Roto-Lith Ltd., New York, N. Y.
Rowell, E. N. Co., Inc., Batavia, N. Y.
Royal, Thomas M. & Co., Phila., Pa.
St. Louis Lithographing Co., St. Louis, Mo.
Sale Lithograph Co., Buffalo, N. Y.
Schmidt, Henry & Bro., Inc., Phila., Pa.
Schmidt Lithograph Co., San Francisco, Calif.
Shellmar Products Corp., Mt. Vernon, Ohio
Shuman, Frank G. Co., The, Chicago, Ill.
Simpson & Doeller Co., The, Baltimore, Md.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Sterling Offset Co., New York, N. Y.
Tablet & Ticket Co., The, Chicago, Ill.
Talmadge Printing Co., New York, N. Y.
Tompkins' Label Service, Phila., Pa.
Trade Lithograph & Printing Co., Inc., New York, N. Y.
Trautmann, Bailey & Blampey, New York, N. Y.
Tuttle Press Co., The, Appleton, Wis.
Unique Printed Products Co., Inc., Terre Haute, Ind.
United States Printing & Lithograph Co., The, Cincinnati, Ohio
Waddill Printing & Lithographing Co., Danville, Va.
Weber Addressing Machine Co., Chicago, Ill.
Western Lithograph Co., Los Angeles, Calif.
Western Waxed Paper Co., Los Angeles, Calif.
Wheeler-Van Label Co., Grand Rapids, Mich.
Wilkata Folding Box Co., Kearny, N. J.
Wilmanns Bros. Co., Milwaukee, Wis.
Yorkville Paper Co., Inc., New York, N. Y.

LACQUERS & VARNISHES

(See Coatings, Protective)

LATEX

(See Rubber, Coatings & Impregnants)

LEATHERETTE

(See also Paper, Imitation Leather)

Aldine Paper Co., Inc., New York, N. Y.
Anderson, Geo. W. Inc., Long Island City, N. Y.
Bradner Smith & Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Cleaveland Lab. & Mfg. Co., Inc., Peapack, N. J.
Columbus Coated Fabrics Corp., Columbus, Ohio
Dejonge, Louis & Co., New York, N. Y.
Detroit Sulphite Pulp & Paper Co., Detroit, Mich.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Griffin, Campbell, Hayes, Walsh, Inc., New York, N. Y.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Holliston Mills, Inc., The, Norwood, Mass.
Marvellum Co., Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Narragansett Coated Paper Corp., Pawtucket, R. I.
National Metal Edge Box Co., Phila., Pa.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Pyrotex Leather Co., Leominster, Mass.

Springfield Coated Paper Corp., Camden, N. J.
Textileather Corp., Toledo, Ohio
United Mfg. Co., Springfield, Mass.
United States Rubber Co., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.
Zapon Div., Atlas Powder Co., Stamford, Conn.; N. Chicago, Ill.

LINERS, BAG, BARREL, BOX & CASE

Andrews, O. B. Co., Chattanooga, Tenn.
Angier Corp., Framingham, Mass.
Arkell Safety Bag Co., New York, N. Y.
Bemis Bro. Bag Co., St. Louis, Mo.
Bemiss Jason Co., San Francisco, Calif.
Betner, Benj. C. Co., Devon, Pa.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Cadillac Products, Inc., Detroit, Mich.
Central Ohio Paper Co., The, Columbus, Ohio
Central States Paper & Bag Co., St. Louis, Mo.
Central Waxed Paper Co., Chicago, Ill.
Chase Bag Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Continental Bag Specialties Corp., New York, N. Y.
Continental Paper Products Co., Denver, Colo.
Criterion Paper Corp., New York, N. Y.
Cromwell Paper Co., The, Chicago, Ill.
Disbrow Mfg. Co., The, Newark, N. J.
Fabricated Products Co., Pittsburgh, Pa.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Hardin Bag & Burlap Co., Inc., The, New Orleans, La.
Heaphy, Charles F. Co., New York, N. Y.
Interstate Folding Box Co., Middletown, Ohio
Kehr Paper Products Co., Phila., Pa.
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
LaBoiteaux Co., Inc., The, Cincinnati, Ohio
Matthias Paper Corp., Phila., Pa.
Mehl Mfg. Co., Cincinnati, Ohio
Merchant Suppliers Paper Co., New York, N. Y.
Merkle Corp., Phila., Pa.
Moist-R-Proof Container Co., San Francisco, Calif.
National Water-Proofing Co., Camden, N. J.
Oneida Paper Products, Inc., New York, N. Y.
Paramount Paper Products Co., Inc., Phila., Pa.
Protective Coating Corp., Belleville, N. J.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Rinkle Krinkle Paper Co., Boston, Mass.
Reynolds Metals Co., Richmond, Va.
Riegel Paper Corp., New York, N. Y.
St. Regis Paper Co., New York, N. Y.
Schmidt Lithograph Co., San Francisco, Calif.
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Traver Corp., Chicago, Ill.
Twitchell, E. W. Inc., Pkg. Div., Phila., Pa.
Ullman Bag Co., Detroit, Mich.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Warren, S. D. Co., Boston, Mass.
Western Waxed Paper Co., Los Angeles, Calif.
Williams, Chas. W. & Co., Inc., New York, N. Y.

LINERS, CLOSURE

(See Closure Liners)

OPENING TAPE

(For Cellophane Packages)

Chicago Printed String Co., Chicago, Ill.
Dobeckmun Co., The, Cleveland, Ohio
Fibre Cord Co., New York, N. Y.
Shellmar Products Corp., Mt. Vernon, Ohio
Sylvania Industrial Corp., New York, N. Y.
Walser Mfg. Co., Inc., Clifton, N. J.

PADDING & WADDING

American Excelsior Corp., Chicago, Ill.
American Lace Paper Co., Milwaukee, Wis.
Cellulose Wadding Products, Inc., Garwood, N. J.
Cottonluxe Mfg. Co., New York, N. Y.
Excelsior Paper Specialties Co., Inc., New York, N. Y.
Henle Wax Paper Mfg. Co., Inc., The, New York, N. Y.
Jiffy Mfg. Co., Hillside, N. J.
Kimberly-Clark Corp., Neenah, Wis.
Republic Paperboard Co., The, Cincinnati, Ohio
Shamrock Co., The, St. Louis, Mo.
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Sweetnam, Geo. H. Inc., Cambridge, Mass.
Union Wadding Co., Pawtucket, R. I.

PAPER, ALKALI-PROOF

Aldine Paper Co., Inc., New York, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Carbide & Carbon Chemicals Corp., New York, N. Y.
Central Paper Co., Inc., Muskegon, Mich.
Central Waxed Paper Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dunn Sulphite Paper Co., Port Huron, Mich.
Heaphy, Charles F. Co., New York, N. Y.
Hollingsworth & Whitney Co., Boston, Mass.
Hughes & Hoffman, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Matthias Paper Corp., Phila., Pa.
Oxford Paper Co., New York, N. Y.
Plastic Coating Corp., Holyoke, Mass.
Riegel Paper Corp., New York, N. Y.
Smith, H. P. Paper Co., Chicago, Ill.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Carbide & Carbon Corp., New York, N. Y.
United Mfg. Co., Springfield, Mass.
Warren, S. D. Co., Boston, Mass.
Western Waxed Paper Co., Los Angeles, Calif.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, ANTI-TARNISH

Aldine Paper Co., Inc., New York, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Central Paper Co., Inc., Muskegon, Mich.
Chemical Paper Mfg. Co., Holyoke, Mass.
Chicago Paper Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Cromwell Paper Co., The, Chicago, Ill.
Crystal Tissue Co., Middletown, Ohio
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dennison Mfg. Co., Framingham, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Hollingsworth & Whitney Co., Boston, Mass.
Hughes & Hoffman, New York, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Little Falls Paper Co., Inc., Newburgh, N. Y.
Matthias Paper Corp., Phila., Pa.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Mosinee Paper Mills Co., Mosinee, Wis.
Paterson Parchment Paper Co., Bristol, Pa.
Pejepscot Paper Co., Inc., New York, N. Y.
Plastic Coating Corp., Holyoke, Mass.
Riegel Paper Corp., New York, N. Y.
Rondout Paper Mills, Inc., Napanoch, N. Y.
Smith, H. P. Paper Co., Chicago, Ill.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
United Mfg. Co., Springfield, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, CAST COATED

Aldine Paper Co., Inc., New York, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio
Champion Paper & Fibre Co., The, Hamilton, Ohio
Heaphy, Charles F. Co., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Protective Coating Corp., Belleville, N. J.
Smith, H. P. Paper Co., Chicago, Ill.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.

PAPER, CLOTH LINED

Aldine Paper Co., Inc., New York, N. Y.
Angier Corp., Framingham, Mass.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Chicago Paper Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Holes, Floyd A. Co., The, Bedford, Ohio
Kaplan Products & Textiles, Inc., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Middlesex Products Corp., Cambridge, Mass.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
National Water-Proofing Co., Camden, N. J.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Rexford Paper Co., Milwaukee, Wis.
Smith, H. P. Paper Co., Chicago, Ill.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
United Mfg. Co., Springfield, Mass.
Western Waxed Paper Co., Los Angeles, Calif.

PAPER, CORRUGATED

(Flexible, Wrapping & Packing)

Ajax Box Co., The, Chicago, Ill.
Andrews, O. B. Co., Chattanooga, Tenn.
Ashtabula Corrugated Box Co., The, Ashtabula, Ohio
Bemiss Jason Co., San Francisco, Calif.
Birmingham Paper Co., Birmingham, Ala.
Blake, Moffitt & Towne, San Francisco, Calif.
Crescent Box Corp., Phila., Pa.
Criterion Paper Corp., New York, N. Y.
Fort Wayne Corrugated Paper Co., Fort Wayne, Ind.
Gaylord Container Corp., St. Louis, Mo.
Grand-City Container Corp., New York, N. Y.
Harvey Paper Products, Sturgis, Mich.
Hinde & Dauch Paper Co., The, Sandusky, Ohio
Kress, F. J. Box Co., Pittsburgh, Pa.
Leeds Sales Co., Inc., New York, N. Y.
Merchant Suppliers Paper Co., New York, N. Y.
National Container Corp., Long Island City, N. Y.

XUM

Ohio Boxboard Co., The, Rittman, Ohio
Ottowa River Paper Co., The, Toledo, Ohio
Salwen, Joe Paper Products Corp., New York, N. Y.
Shamrock Co., The, St. Louis, Mo.
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Shopsin Paper Co., New York, N. Y.
Superior Paper Products Co., Pittsburgh, Pa.
Waldorf Paper Products Co., St. Paul, Minn.
Yorkville Paper Co., Inc., New York, N. Y.

PAPER, CORRUGATED

(For Window Trimming)

Ajax Box Co., The, Chicago, Ill.
Bemiss Jason Co., San Francisco, Calif.
Blake, Moffitt & Towne, San Francisco, Calif.
Excelsior Paper Specialties Co., Inc., New York, N. Y.
Hankins Container Co., Cleveland, Ohio
Reyburn Mfg. Co., Inc., The, Phila., Pa.
Sherman Paper Products Corp., Newton Upper Falls, Mass.

PAPER, CREPE

American Tissue Mills, Holyoke, Mass.
Central Paper Co., Inc., Muskegon, Mich.
Cincinnati Industries Inc., Cincinnati, Ohio
Dennison Mfg. Co., Framingham, Mass.
Dunn Sulphite Paper Co., Port Huron, Mich.
Erving Paper Mills, Erving, Mass.
Mosinee Paper Mills Co., Mosinee, Wis.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Reed Tissues Corp., Little Falls, N. Y.
Reyburn Mfg. Co., Inc., The, Phila., Pa.
Rondout Paper Mills, Inc., Napanoch, N. Y.
Smith, H. P. Paper Co., Chicago, Ill.
Sweetnam, Geo. H. Inc., Cambridge, Mass.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tuttle Press Co., The, Appleton, Wis.

PAPER, EXCELSIOR & SHREDDED

American Excelsior Corp., Chicago, Ill.
Atlantic Excelsior Co., Inc., New York, N. Y.
Ben Mont Papers, Inc., Bennington, Vt.
Blake, Moffitt & Towne, San Francisco, Calif.
Criterion Paper Corp., New York, N. Y.
Daniels Mfg. Co., Rhinelander, Wis.
Detroit Sulphite Pulp & Paper Co., Detroit, Mich.
Dunn Sulphite Paper Co., Port Huron, Mich.
Erving Paper Mills, Erving, Mass.
Excelsior Paper Specialties Co., Inc., New York, N. Y.
Fabricon Products of Conn., Inc., Bridgeport, Conn.
Jiffy Mfg. Co., Hillside, N. J.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Leeds Sales Co., Inc., New York, N. Y.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Paterson Parchment Paper Co., Bristol, Pa.
Protective Packaging Corp., Newark, N. J.
Rhinelander Paper Co., Rhinelander, Wis.
Shamrock Co., The, St. Louis, Mo.
Specialty Papers Co., The, Dayton, Ohio
Sweetnam, Geo. H. Inc., Cambridge, Mass.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
West Carrollton Parchment Co., West Carrollton, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Yorkville Paper Co., Inc., New York, N. Y.

PAPER, FANCY PRINTED OR EMBOSSED

Aldine Paper Co., Inc., New York, N. Y.
Anderson, George W. Inc., Long Island City, N. Y.
Ben Mont Papers, Inc., Bennington, Vt.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N.Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Champion Paper & Fibre Co., The, Hamilton, Ohio
Chemical Paper Mfg. Co., Holyoke, Mass.
Chicago Paper Co., Chicago, Ill.
Chicago Printed String Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Crown Zellerbach Corp., San Francisco, Calif.
Crystal Tissue Co., Middletown, Ohio
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dejonge, Louis & Co., New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Detroit Sulphite Pulp & Paper Co., Detroit, Mich.
District of Columbia Paper Mills, Inc., Washington, D. C.
Eureka Specialty Prtg. Co., Scranton, Pa.
Frann Paper Co., Bklyn, N. Y.
Gala Giftwraps & Specialties, Inc., New York, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Holyoke Card & Paper Co., Springfield, Mass.
Hughes & Hoffman, New York, N. Y.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Keller-Dorian Corp., New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Makdon Co., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Middlesex Products Corp., Cambridge, Mass.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
New England Card & Paper Co., Springfield, Mass.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Paper City Mfg. Co., Inc., Holyoke, Mass.
Pejepscot Paper Co., New York, N. Y.
Plastic Coating Corp., Holyoke, Mass.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Pyrotex Leather Co., Leominister, Mass.
Racquette River Paper Co., Potsdam, N. Y.
Reinhold-Gould, Inc., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
Simplex Textured Reproductions, Inc., New York, N. Y.
Springfield Coated Paper Corp., Camden, N. J.
Stevens, Nelson Paper Corp., New York, N.Y.
Tamm & Co., New York, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Trautmann, Bailey & Blampey, New York, N. Y.
Tuttle Press Co., The, Appleton, Wis.
United Mfg. Co., Springfield, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Whiting, C. R. Co., Inc., Hackensack, N. J.
Wyomissing Glazed Paper Co., Reading, Pa.
Yorkville Paper Co., Inc., New York, N. Y.

PAPER, FLINT GLAZED

Aldine Paper Co., Inc., New York, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N.Y.
Chicago Paper Co., Chicago, Ill.
Dejonge, Louis & Co., New York, N. Y.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Hughes & Hoffman, New York, N. Y.
Keller-Dorian Corp., New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Pejepscot Paper Co., Inc., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
United Mfg. Co., Springfield, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, FOIL

Aldine Paper Co., Inc., New York, N. Y.
Anderson, George W. Inc., Long Island City, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N.Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Waxed Paper Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Crown Zellerbach Corp., San Francisco, Calif.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dejonge, Louis & Co., New York, N. Y.
District of Columbia Paper Mills, Inc., Washington, D. C.
Fabricon Products of Conn., Inc., Bridgeport, Conn.
Frann Paper Co., Bklyn, N. Y.
General Felt Products, Div. Standard Cap & Seal Corp., Brooklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Hughes & Hoffman, New York, N. Y.
Johnston Tin Foil & Metal Co., The, St. Louis, Mo.
Keller-Dorian Corp., New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Middlesex Products Corp., Cambridge, Mass.
Miller Paper Co., New York, N. Y.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Paper City Mfg. Co., Inc., Holyoke, Mass.
Royal Paper Corp., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
Smith, H. P. Paper Co., Chicago, Ill.
Springfield Coated Paper Corp., Camden, N. J.
Stevens, Nelson Paper Corp., New York, N. Y.
Tamm & Co., New York, N. Y.
Western Waxed Paper Co., Los Angeles, Calif.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, FRICTION GLAZED

Aldine Paper Co., Inc., New York, N. Y.
Ben Mont Papers, Inc., Bennington, Vt.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Crown Zellerbach Corp., San Francisco, Calif.
Dejonge, Louis & Co., New York, N. Y.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hughes & Hoffman, New York, N. Y.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Kupfer Bros. Co., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Middlesex Products Corp., Cambridge, Mass.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
New England Card & Paper Co., Springfield, Mass.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Pejepscot Paper Co., Inc., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Springfield Coated Paper Corp., Camden, N. J.
United Mfg. Co., Springfield, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, GLASSINE

(Plain & Embossed)

Daniels Mfg. Co., Rhinelander, Wis.
Deerfield Glassine Co., Monroe Bridge, Mass.
Glassine Paper Co., The, W. Conshohocken, Pa.
Hamersley Mfg. Co., The, Garfield, N. J.
Hartford City Paper Co., New York, N. Y.
Henle Wax Paper Mfg. Co., Inc., The, New York, N. Y.
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Shawmut Waxed Paper Co., Holliston, Mass.
Southern Waxed Paper Co., Atlanta, Ga.
Sweetnam, George H. Inc., Cambridge, Mass.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Western Waxed Paper Co., Los Angeles, Calif.
Westfield River Paper Co., Inc., Russell, Mass.

PAPER, GREASEPROOF

Aldine Paper Co., Inc., New York, N. Y.
Angier Corp., Framingham, Mass.
Arvey Corp., Chicago, Ill.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Cellutin Corp., The, Holyoke, Mass.
Central Paper Co., Inc., Muskegon, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Central Waxed Paper Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Colonial Envelope Co., New York, N. Y.
Converter Corp., Clinton, Mass.
Cromwell Paper Co., The, Chicago, Ill.
Daniels Mfg. Co., Rhinelander, Wis.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Deerfield Glassine Co., Monroe Bridge, Mass.
Glassine Paper Co., The, W. Conshohocken, Pa.
Hamersley Mfg. Co., The, Garfield, N. J.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Henle Wax Paper Mfg. Co., Inc., The, New York, N. Y.
Holes, Floyd A. Co., The, Bedford, Ohio
Hughes & Hoffman, New York, N. Y.
Interstate Folding Box Co., Middletown, Ohio
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Paterson Parchment Paper Co., Bristol, Pa.
Presstite Engineering Co., St. Louis, Mo.
Protective Packaging Corp., Newark, Ohio
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Shawmut Waxed Paper Co., Holliston, Mass.
Smith, H. P. Paper Co., Chicago, Ill.
Sweetnam, George H. Inc., Cambridge, Mass.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
Warren, S. D. Co., Boston, Mass.
Western Waxed Paper Co., Los Angeles, Calif.
Westfield River Paper Co., Inc., Russell, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, GUMMED

Atlantic Gummed Paper Corp., Bklyn, N. Y.
Brown-Bridge Mills, Inc., The, Troy, Ohio
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Chicago Gum Tape Co., Chicago, Ill.
Dennison Mfg. Co., Framingham, Mass.
Eureka Specialty Printing Co., Scranton, Pa.
Gummed Products Co., The, Troy, Ohio
Gummed Tape & Devices Co., Bklyn, N. Y.
Knowlton, M. D. Co., Rochester, N. Y.
McLaurin-Jones Co., Brookfield, Mass.
Merchant Suppliers Paper Co., New York, N. Y.
Mid-States Gummed Paper Co., Chicago, Ill.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Paper Mfrs. Co., Phila., Pa.
Salwen, Joe Paper Products Corp., New York, N. Y.

PAPER, HEAT SEALING

Aldine Paper Co., Inc., New York, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Brown-Bridge Mills, Inc., The, Troy, Ohio
Bulkley, Dunton & Co., Inc., New York, N.Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Central Waxed Paper Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Cleaveland Lab. & Mfg. Co., Peapack, N. J.
Converter Corp., Clinton, Mass.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dennison Mfg. Co., Framingham, Mass.
Fabricon Products of Conn., Inc., Bridgeport, Conn.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Henle Wax Paper Mfg. Co., Inc., The, New York, N. Y.
Holes, Floyd A. Co., The, Bedford, Ohio
Hubbs, Charles F. & Co., New York, N. Y
Hughes & Hoffman, New York, N. Y.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Keller-Dorian Corp., New York, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Marathon Corp., Menasha, Wis.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Mid-States Gummed Paper Co., Chicago, Ill.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Oxford Paper Co., New York, N. Y.
Paper Mfrs. Co., Phila., Pa.
Pollock Paper & Box Co., Dallas, Texas
Protective Coating Corp., Belleville, N. J.
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Shawmut Waxed Paper Co., Holliston, Mass.
Shellmar Products Corp., Mt. Vernon, Ohio
Smith, H. P. Paper Co., Chicago, Ill.
Specialty Papers Co., The, Dayton, Ohio
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
U. S. Finishing & Mfg. Co., Chicago, Ill.
Warren, S. D. Co., Boston, Mass.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, IMITATION FOIL

Aldine Paper Co., Inc., New York, N. Y.
Anderson, George W. Inc., Long Island City, N. Y.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Chicago Paper Co., Chicago, Ill.
Coughlin Mfg. Co., New York, N. Y.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dejonge, Louis & Co., New York, N. Y.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Hughes & Hoffman, New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Co., Phila., Pa.
Middlesex Products Corp., Cambridge, Mass.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Reinhold-Gould, Inc., New York, N. Y.
Riegel Paper Corp., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
Smith, H. P. Paper Co., Chicago, Ill.
Springfield Coated Paper Corp., Camden, N. J.
Warren, S. D. Co., Boston, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.
Yorkville Paper Co., Inc., New York, N. Y.

PAPER, IMITATION LEATHER

Aldine Paper Co., Inc., New York, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.

Bulkley, Dunton & Co., Inc., New York, N. Y.
Central Paper Co., Inc., Muskegon, Mich.
Champion Paper & Fibre Co., Hamilton, Ohio
Chicago Paper Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Columbus Coated Fabrics Corp., Columbus, Ohio
Dejonge, Louis & Co., New York, N. Y.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Leather Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Holyoke Card & Paper Co., Springfield, Mass.
Hughes & Hoffman, New York, N. Y.
Hummel-Ross Fibre Corp., Hopewell, Va.
Kaplan Products & Textiles, Inc., New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Middlesex Products Corp., Cambridge, Mass.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Plastic Coating Corp., Holyoke, Mass.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Pyrotex Leather Co., Leominster, Mass.
Racquette River Paper Co., Potsdam, N. Y.
Reinhold-Gould, Inc., New York, N. Y.
Riegel Paper Corp., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Springfield Coated Paper Corp., Camden, N. J.
Tamm & Co., New York, N. Y.
Textileather Corp., Toledo, Ohio
United Mfg. Co., Springfield, Mass.
Whiting, C. R. Co., Inc., Hackensack, N. J.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, IMPREGNATED

Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Chicago Paper Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Fabricon Products of Conn., Inc., Bridgeport, Conn.
Heaphy, Charles F. Co., New York, N. Y.
Hummel-Ross Fibre Corp., Hopewell, Va.
Kalamazoo Parchment Co., Kalamazoo, Mich.
Leeds Sales Co., Inc., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Mid-States Gummed Paper Co., Chicago, Ill.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Presstite Engineering Co., St. Louis, Mo.
Protective Coating Corp., Belleville, N. J.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Riegel Paper Corp., New York, N. Y.
Rogers Corp., Manchester, Conn.
Smith, H. P. Paper Co., Chicago, Ill.
Springfield Coated Paper Corp., Camden, N. J.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
Warren, S. D. Co., Boston, Mass.
Western Waxed Paper Co., Los Angeles, Calif.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, KRAFT

Bulkley, Dunton & Co., Inc., New York, N.Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Champion Paper & Fibre Co., Hamilton, Ohio
Claremont Paper Co., New York, N. Y.
Dunn Sulphite Paper Co., Port Huron, Mich.
Gaylord Container Corp., St. Louis, Mo.
Gummed Tape & Devices Co., Bklyn, N. Y.
Hummel-Ross Fibre Corp., Hopewell, Va.
Mosinee Paper Mills Co., Mosinee, Wis.
Southern Kraft Div., International Paper Co., New York, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Bag & Paper Corp., New York, N. Y.

PAPER, LAMINATED

Aldine Paper Co., Inc., New York, N. Y.
American Coating Mills, Inc., Elkhart, Ind.
Arvey Corp., Chicago, Ill.
Atlantic Gummed Paper Corp., Bklyn, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Central Waxed Paper Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Converter Corp., Clinton, Mass.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dobeckmun Co., The, Cleveland, Ohio
Fabricon Products of Conn., Inc., Bridgeport, Conn.
General Felt Products, Div. Standard Cap & Seal Corp., Bklyn, N. Y.
Glassine Paper Co., The, W. Conshohocken, Pa.
Hamersley Mfg. Co., The, Garfield, N. J.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Holes, Floyd A. Co., The, Bedford, Ohio
Irvington Varnish & Insulator Co., Irvington, N. J.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Leeds Sales Co., Inc., New York, N. Y.
Marathon Corp., Menasha, Wis.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Mid-States Gummed Paper Co., Chicago, Ill.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
New England Card & Paper Co., Springfield, Mass.
Oxford Paper Co., New York, N. Y.
Paterson Parchment Paper Co., Bristol, Pa.
Pollock Paper & Box Co., Dallas, Texas
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Protective Packaging Corp., Newark, N. J.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Shellmar Products Corp., Mt. Vernon, Ohio
Shopsin Paper Co., New York, N. Y.
Simon Adhesives Prods. Corp., New York, N. Y.
Sisalkraft Co., The, Chicago, Ill.
Smith, H. P. Paper Co., Chicago, Ill.
Southern Waxed Paper Co., Atlanta, Ga.
Specialty Papers Co., The, Dayton, Ohio
Springfield Coated Paper Corp., Camden, N. J.
Sweetnam, George H. Inc., Cambridge, Mass.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
United Mfg. Co., Springfield, Mass.
U. S. Finishing & Mfg. Co., Chicago, Ill.
Western Products Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Westfield River Paper Co., Inc., Russell, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, LIGHT-RESISTANT

Bradner Smith & Co., Chicago, Ill.
Central Paper Co., Inc., Muskegon, Mich.
Cleaveland Labs. & Mfg. Co., Peapack, N. J.
Glassine Paper Co., The, W. Conshohocken, Pa.
Heaphy, Charles F. Co., New York, N. Y.
Keller-Dorian Corp., New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Paterson Parchment Paper Co., Bristol, Pa.
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Smith, H. P. Paper Co., Chicago, Ill.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Warren, S. D. Co., Boston, Mass.

PAPER, MAT- OR ANTIQUE-COATED

Aldine Paper Co., Inc., New York, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Hinkson Paper Co., Palmer, Mass.
Holyoke Card & Paper Co., Springfield, Mass.
Hughes & Hoffman, New York, N. Y.
Kupfer Bros., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Narragansett Coated Paper Corp., Pawtucket, R. I.
New England Card & Paper Co., Springfield, Mass.
Reinhold-Gould, Inc., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
United Mfg. Co., Springfield, Mass.
Warren, S. D. Co., Boston, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, METALLIC-COATED

(Plain and Embossed)

Aldine Paper Co., Inc., New York, N. Y.
Artcote Papers, Inc., Irvington, N. J.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio

Central Paper Co., Inc., Muskegon, Mich.
Chicago Paper Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dejonge, Louis & Co., New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Eureka Specialty Printing Co., Scranton, Pa.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Chas. F. Co., New York, N. Y.
Hughes & Hoffman, New York, N. Y.
Keller-Dorian Corp., New York, N. Y.
Kupfer Bros., Co., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Middlesex Products Corp., Cambridge, Mass.
Miller Paper Co., New York, N. Y.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Plastic Coating Corp., Holyoke, Mass.
Pyrotex Leather Co., Leominster, Mass.
Racquette River Paper Co., Potsdam, N. Y.
Reinhold-Gould, Inc., New York, N. Y.
Riegel Paper Corp., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
Smith, H. P. Paper Co., Chicago, Ill.
Springfield Coated Paper Corp., Camden, N. J.
Stevens, Nelson Paper Corp., New York, N. Y.
Tamm & Co., New York, N. Y.
United Mfg. Co., Springfield, Mass.
Warren, S. D. Co., Boston, Mass.
Whiting, C. R. Co., Inc., Hackensack, N. J.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.
Yorkville Paper Co., Inc., New York, N. Y.

PAPER, MICA-COATED

Aldine Paper Co., Inc., New York, N. Y.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Chicago Paper Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dejonge, Louis & Co., New York, N. Y.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Holyoke Card & Paper Co., Springfield, Mass.
Hughes & Hoffman, New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Middlesex Products Corp., Cambridge, Mass.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Reinhold-Gould, Inc., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
United Mfg. Co., Springfield, Mass.
Whiting, C. R. Co., Inc., Hackensack, N. J.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, MOISTURE-VAPOR RESISTANT

Aldine Paper Co., Inc., New York, N. Y.
Angier Corp., Framingham, Mass.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co. Inc., New York, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Chicago Paper Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Cleaveland Lab. & Mfg. Co., Peapack, N. J.
Converter Corp., Clinton, Mass.
Cromwell Paper Co., The, Chicago, Ill.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Deerfield Glassine Co., Monroe Bridge, Mass.
Dennison Mfg. Co., Framingham, Mass.
Fabricated Products Co., Pittsburgh, Pa.
Glassine Paper Co., The, W. Conshohocken, Pa.
Heaphy, Charles F. Co., New York, N. Y.
Hinkson Paper Co., Palmer, Mass.
Holes, Floyd A. Co., The, Bedford, Ohio
Hughes & Hoffman, New York, N. Y.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Keller-Dorian Corp., New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Marathon Corp., Menaska, Wis.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Mosinee Paper Mills Co., Mosinee, Wis.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
National Water-Proofing Co., Camden, N. J.
Oxford Paper Co., New York, N. Y.
Paterson Parchment Paper Co., Bristol, Pa.
Plastic Coating Corp., Holyoke, Mass.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Presstite Engineering Co., St. Louis, Mo.
Protective Coating Corp., Belleville, N. J.
Protective Packaging Corp., Newark, N. J.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Rexford Paper Co., Milwaukee, Wis.
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Shawmut Waxed Paper Co., Holliston, Mass.
Shellmar Products Corp., Mt. Vernon, Ohio
Sisalkraft Co., The, Chicago, Ill.
Smith, H. P. Paper Co., Chicago, Ill.
Southern Waxed Paper Co., Atlanta, Ga.
Specialty Papers Co., The, Dayton, Ohio
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
United Mfg. Co., Springfield, Mass.
U. S. Finishing & Mfg. Co., Chicago, Ill.
Warren, S. D. Co., Boston, Mass.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Westfield River Paper Co., Inc., Russell, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Yorkville Paper Co., Inc., New York, N. Y.

PAPER, MOLD-RESISTANT

Bradner Smith & Co., Chicago, Ill.
Central Paper Co., Inc., Muskegon, Mich.
Chicago Paper Co., Chicago, Ill.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dejonge, Louis & Co., New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Glassine Paper Co., The, W. Conshohocken, Pa.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Kupfer Bros. Co., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Protective Coating Corp., Belleville, N. J.
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Smith, H. P. Paper Co., Chicago, Ill.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Warren, S. D. Co., Boston, Mass.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, NON-CORROSIVE

Aldine Paper Co., Inc., New York, N. Y.
Angier Corp., Framingham, Mass.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Chicago Paper Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Glassine Paper Co., The, W. Conshohocken, Pa.
Hamersley Mfg. Co., The, Garfield, N. J.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Mosinee Paper Mills Co., Mosinee, Wis.
Protective Packaging Corp., Newark, N. J.
Riegel Paper Corp., New York, N. Y.
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Smith, H. P. Paper Co., Chicago, Ill.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
Warren, S. D. Co., Boston, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, PYROXYLIN-COATED

Aldine Paper Co., Inc., New York, N. Y.
Artcote Papers, Inc., Irvington, N. J.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Chicago Paper Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Dejonge, Louis & Co., New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Frann Paper Co., Bklyn, N. Y.
General Felt Products, Div. Standard Cap & Seal Corp., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Hughes & Hoffman, New York, N. Y.
Kaplan Products & Textiles, Inc., New York, N. Y.
Kupfer Bros Co., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Miller Paper Co., New York, N. Y.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Plastic Coating Corp., Holyoke, Mass.
Pollock Paper & Box Co., Dallas, Texas
Pyrotex Leather Co., Leominster, Mass.

XUM

Pyroxylin Products, Inc., Chicago, Ill.
Reinhold-Gould, Inc., New York, N. Y.
Riegel Paper Corp., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
Tamm & Co., New York, N. Y.
Textileather Corp., Toledo, Ohio
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Whiting, C. R. Co., Inc., Hackensack, N. J.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, REINFORCED

Angier Corp., Framingham, Mass.
Bradner Smith & Co., Chicago, Ill.
Central Paper Co., Inc., Muskegon, Mich.
Cincinnati Industries, Inc., Cincinnati, Ohio
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Sisalkraft Co., The, Chicago, Ill.
Smith, H. P. Paper Co., Chicago, Ill.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Western Waxed Paper Co., Los Angeles, Calif.

PAPER, TISSUE

Adams Paper Co., Wells River, Vt.
Aldine Paper Co., Inc., New York, N. Y.
American Tissue Mills, Holyoke, Mass.
Ashuelot Paper Co., Hinsdale, N. H.
Ben Mont Papers, Inc., Bennington, Vt.
Berwin Paper Corp., Dansville, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Brooks Paper Co., St. Louis, Mo.
Burrows Paper Corp., Little Falls, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio
Chicago Paper Co., Chicago, Ill.
Chicago Printed String Co., Chicago, Ill.
Consolidated Water & Power Co., Wisconsin Rapids, Wis.
Coy Paper Co., Claremont, N. H.
Criterion Paper Corp., New York, N. Y.
Crown-Willamette Paper Co., San Francisco, Calif.
Crystal Tissue Co., Middletown, Ohio
Dennison Mfg. Co., Framingham, Mass.
Detroit Sulphite & Paper Co., Detroit, Mich.
Dexter, C. H. & Sons, Inc., Windsor Locks, Conn.
Diamond Paper Mills Co., Inc., New York, N. Y.
Dunn Sulphite Paper Co., Port Huron, Mich.
Earl, M. J. Co., Inc., Reading, Pa.
Economy Box & Pie Plate Co., Marion, Ind.
Eden Paper Co., Lancaster, Pa.
Erving Paper Mills, Erving, Mass.
Fabricon Products of Conn., Inc., Bridgeport, Conn.
Fernstrom Paper Mills, Inc., Pomona, Calif.
Fillmore & Slade, N. Bennington, Vt.
Flower City Tissue Mills Co., Rochester, N. Y.
Fort Howard Paper Co., Green Bay, Wis.
Frost White Paper Mills, Inc., New York, N. Y.
General Cellulose Co., Inc., The, Garwood, N. J.
Gotham Tissue Corp., New York, N. Y.
Graham Mfg. Co., Holyoke, Mass.
Hawley Pulp & Paper Co., Portland, Ore.
Hoberg Paper Mills, Green Bay, Wis.
Hudson Pulp & Paper Corp., New York, N. Y.
International Paper Co., New York, N. Y.
Latimer, E., Jr. & Co., Phila., Pa.
Leeds Sales Co., Inc., New York, N. Y.
Little Falls Paper Co., Inc., Newburgh, N. Y.
Matthias Paper Corp., Phila., Pa.
McIntyre Bros. Paper Co., Inc., Fayetteville, N. Y.
Minerva Wax Paper Co., Minerva, Ohio
Mohawk Valley Paper Co., Inc., Little Falls, N. Y.
Moyer & Pratt, Inc., Lyons Falls, N. Y.
North American Pulp & Paper Co., New York, N. Y.
North End Paper Co., Fulton, N. Y.
Northern Paper Mills, Green Bay, Wis.
Oswego River Paper Mills, Phoenix, N. Y.
Pacific Coast Paper Mills, Bellingham, Wash.
Peerless Paper Mills, Inc., Oaks, Pa.
Pequannock Valley Paper Co., Butler, N. J.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Reed Tissues Corp., Little Falls, N. Y.
River Valley Tissue Mills, Inc., Phoenix, N. Y.
Robertson Co., The, Hinsdale, N. H.
Robertson, G. E. & Co., Hinsdale, N. H.
Rondout Paper Mills, Inc., Napanoch, N. Y.
Rushmore Paper Mills, Inc., Natural Dam, N. Y.
Russell Products Co., Phila., Pa.
Salwen, Joe Paper Products Corp., New York, N. Y.
Sanitary Paper Mills, Inc., East Hartford, Conn.
Senoso Paper Co., Inc., Phoenix, N. Y.
Shawmut Waxed Paper Co., Holliston, Mass.
Smith Paper, Inc., Lee, Mass.
Southern Waxed Paper Co., Atlanta, Ga.
Stevens & Thompson Paper Co., Greenwich, N. Y.
Sweet Bros. Paper Mfg. Co., Phoenix, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tissue Co., Saugerties, N. Y.
Tuttle Press Co., The, Appleton, Wis.
Twitchell, E. W. Inc., Pkg. Div., Phila., Pa.
Victoria Paper Mills Co., Fulton, N. Y.
Waterproof Paper & Board Co., Cincinnati, Ohio
Weber Supply Co., Momence, Ill.
White River Paper Mills, Inc., Indianapolis, Ind.
White-Washburn Co., Inc., Hinsdale, N. H.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wisconsin Tissue Mills, Menasha, Wis.

PAPER, TRADEMARKED

Aldine Paper Co., Inc., New York, N. Y.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Central Paper Co., Inc., Muskegon, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Chicago Paper Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dejonge, Louis & Co., New York, N. Y.
District of Columbia Paper Mills, Inc., Washington, D. C.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hazen, Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Hinkson Paper Co., Palmer, Mass.
Holyoke Card & Paper Co., Springfield, Mass.
Hughes & Hoffman, New York, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Narragansett Coated Paper Corp., Pawtucket, R. I.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
New England Card & Paper Co., Springfield, Mass.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Pejepscot Paper Co., New York, N. Y.
Plastic Coating Corp., Holyoke, Mass.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Racquette River Paper Co., Potsdam, N.Y.
Royal Paper Corp., New York, N. Y.
Springfield Coated Paper Corp., Camden, N. J.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, VEGETABLE PARCHMENT

Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Paterson Parchment Paper Co., Bristol, Pa.
Shawmut Waxed Paper Co., Holliston, Mass.
West Carrollton Parchment Co., West Carrollton, Ohio

PAPER, VELOUR

(Plain, Printed, and Embossed)

Aldine Paper Co., Inc., New York, N. Y.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Cellusuede Products, Inc., Rockford, Ill.
Dejonge, Louis & Co., New York, N. Y.
District of Columbia Paper Mills, Inc., Washington, D. C.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Heaphy, Charles F. Co., New York, N. Y.
Hughes & Hoffman, New York, N. Y.
Kaplan Products & Textiles, Inc., New York, N. Y.
Keller-Dorian Corp., New York, N. Y.
Kupfer Bros. Co., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Salwen, Joe Paper Products Co., New York, N. Y.
Shopsin Paper Co., New York, N. Y.
Tamm & Co., New York, N. Y.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, WATERPROOF

Angier Corp., Framingham, Mass.
Atlantic Gummed Paper Corp., Bklyn, N. Y.
Bemis Bro. Bag Co., St. Louis, Mo.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Central Waxed Paper Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Converter Corp., Clinton, Mass.
Criterion Paper Corp., New York, N. Y.
Cromwell Paper Co., The, Chicago, Ill.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Fabricated Products Co., Pittsburgh, Pa.
Fabricon Products of Conn., Inc., Bridgeport, Conn.
Frann Paper Co., Bklyn, N. Y.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Gummed Tape & Device Co., Bklyn, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.

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Heaphy, Charles F. Co., New York, N. Y.
Henle Wax Paper Mfg. Co., Inc., The, New York, N. Y.
Hinkson Paper Co., Palmer, Mass.
Hughes & Hoffman, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Kupfer Bros. Co., New York. N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Merchant Suppliers Paper Co., New York, N. Y.
Mid-States Gummed Paper Co., Chicago, Ill.
National Water-Proofing Co., Camden, N. J.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Presstite Engineering Co., St. Louis, Mo.
Protective Coating Corp., Belleville, N. J.
Pyrotex Leather Co., Leominster, Mass.
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Shellmar Products Corp., Mt. Vernon, Ohio
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Sisalkraft Co., The, Chicago, Ill.
Smith, H. P. Paper Co., Chicago, Ill.
Specialty Papers Co., The, Dayton, Ohio
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
Union Bag & Paper Corp., New York, N. Y.
United Mfg. Co., Springfield, Mass.
Tuttle Press Co., The, Appleton, Wis.
Warren, S. D. Co., Boston, Mass.
Western Waxed Paper Co., Los Angeles, Calif.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

PAPER, WAXED

American Tissue Mills, Holyoke, Mass.
Arvey Corp., Chicago, Ill.
Ben Mont Papers, Inc., Bennington, Vt.
Central Paper Co., Inc., Muskegon, Mich.
Central Waxed Paper Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Cromwell Paper Co., The, Chicago, Ill.
Crystal Tissue Co., Middletown, Ohio
Deerfield Glassine Co., Monroe Bridge, Mass.
Dixie Wax Paper Co., Inc., Dallas, Texas
Glassine Paper Co., The, W. Conshohocken, Pa.
Hamersley Mfg. Co., The, Garfield, N. J.
Heaphy, Charles F. Co., New York, N. Y.
Henle Wax Paper Mfg. Co., Inc., The, New York, N. Y.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Marathon Corp., Menasha, Wis.
Merchant Suppliers Paper Co., New York, N. Y.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
National Water-Proofing Co., Camden, N. J.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Paterson Parchment Paper Co., Bristol, Pa.
Pollock Paper & Box Co., Dallas, Texas
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Riegel Paper Corp., New York, N. Y.
Shawmut Waxed Paper Co., Holliston, Mass.
Southern Waxed Paper Co., Atlanta, Ga.
Specialty Papers Co., The, Dayton, Ohio
Sweetnam, George H. Inc., Cambridge, Mass.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Bag & Paper Corp., New York, N. Y.
Waterproof Paper & Board Co., Cincinnati, Ohio
West Carrollton Parchment Co., W. Carrollton, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Westfield River Paper Co., Inc., Russell, Mass.

PAPER, WET STRENGTH

Aldine Paper Co., Inc., New York, N. Y.
Angier Corp., Framingham, Mass.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Central Ohio Paper Co., The, Columbus, Ohio
Central Paper Co., Inc., Muskegon, Mich.
Central Waxed Paper Co., Chicago, Ill.
Daniels Mfg. Co., Rhinelander, Wis.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Deerfield Glassine Co., Monroe Bridge, Mass.
Dejonge, Louis & Co., New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Detroit Sulphite Pulp & Paper Co., Detroit, Mich.
Dunn Sulphite Paper Co., Port Huron, Mich.
Fabricon Products of Conn., Inc., Bridgeport, Conn.
Fort Wayne Corrugated Paper Co., Fort Wayne, Ind.
Glassine Paper Co., The, W. Conshohocken, Pa.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F. Co., New York, N. Y.
Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Leeds Sales Co., Inc., New York, N. Y.
Marathon Corp., Menasha, Wis.
Matthias Paper Corp., Phila., Pa.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Oxford Paper Co., New York, N. Y.
Paterson Parchment Paper Co., Bristol, Pa.
Pollock Paper & Box Co., Dallas, Texas
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Sisalkraft Co., The, Chicago, Ill.
Smith, H. P. Paper Co., Chicago, Ill.
Specialty Papers Co., The, Dayton, Ohio
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Union Bag & Paper Corp., New York, N. Y.
Warren, S. D. Co., Boston, Mass.
Western Waxed Paper Co., Los Angeles, Calif.
Westfield River Paper Co., Inc., Russell, Mass.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, WOOD VENEER

(Imitation)

Aldine Paper Co., Inc., New York, N. Y.
Anderson, George W., Inc., Long Island City, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Chicago Paper Co., Chicago, Ill.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
District of Columbia Paper Mills, Inc., Washington, D. C.
Frann Paper Co., Bklyn, N. Y.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hampden Glazed Paper & Card Co., Holyoke, Mass.
Hazen Paper Co., Holyoke, Mass.
Heaphy, Charles F., New York, N. Y.
Hughes & Hoffman, New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Racquette River Paper Co., Potsdam, N. Y.
Reinhold-Gould, Inc., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Springfield Coated Paper Corp., Camden, N. J.
Stecher-Traung Litho. Corp., San Francisco, Calif.
Stevens, Nelson Paper Corp., New York, N. Y.
Tamm & Co., New York, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
United Mfg. Co., Springfield, Mass.
Whiting, C. R. Co., Inc., Hackensack, N. J.
Williams, Chas. W. & Co., Inc., New York, N. Y.

PAPER, WRAPPING

(Fancy Tissue)

Aldine Paper Co., Inc., New York, N. Y.
Anderson, George W., Inc., Long Island City, N. Y.
American Tissue Mills, Holyoke, Mass.
Blake, Moffitt & Towne, San Francisco, Calif.
Ben Mont Papers, Inc., Bennington, Vt.
Bradner Smith & Co., Chicago, Ill.
Central Ohio Paper Co., The, Columbus, Ohio
Chicago Paper Co., Chicago, Ill.
Chicago Printed String Co., Chicago, Ill.
Converter Corp., Clinton, Mass.
Crown Zellerbach Corp., San Francisco, Calif.
Crystal Tissue Co., Middletown, Ohio
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Dejonge, Louis & Co., New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Detroit Sulphite Pulp & Paper Co., Detroit, Mich.
Dunn Sulphite Paper Co., Port Huron, Mich.
Du-Tone Ribbon Corp., New York, N. Y.
Fernstrom Paper Mills, Inc., Pomona, Calif.
Gala Giftwraps & Specialties, Inc., New York, N. Y.
Gaylord Container Corp., St. Louis, Mo.
Genesee Valley Paper Co., Inc., Rochester, N. Y.
Hinkson Paper Co., Palmer, Mass.
Leeds Sales Co., Inc., New York, N. Y.
Marvellum Co., The, Holyoke, Mass.
Matthias Paper Corp., Phila., Pa.
Merchant Suppliers Paper Co., New York, N. Y.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Moyer & Pratt, Inc., Lyons Falls, N. Y.
Pejepscot Paper Co., New York, N. Y.
Port Huron Sulphite & Paper Co., Port Huron, Mich.
Rondout Paper Mills, Inc., Napanoch, N. Y.
Royal Paper Corp., New York, N. Y.
Springfield Coated Paper Corp., Camden, N. J.
Stevens, Nelson Paper Corp., New York, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tuttle Press Co., The, Appleton, Wis.
Williams, Chas. W. & Co., Inc., New York, N. Y.
Wyomissing Glazed Paper Co., Reading, Pa.

XUM

PARTITIONS

Abana Products, Chicago, Ill.
Andrews, O. B. Co., Chattanooga, Tenn.
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Fabricated Products Co., Pittsburgh, Pa.
Freedman Die Cutters, Inc., New York, N.Y.
Globe Paper Box Co., Chicago, Ill.
Hope Paper Box Co., Providence, R. I.
Inman Mfg. Co., Inc., Amsterdam, N. Y.
Keyes Fibre Co., Waterville, Maine
Kress, F. J. Box Co., Pittsburgh, Pa.
Loroco Industries, Inc., Reading, Ohio
National Metal Edge Box Co., Phila., Pa.
Old Dominion Box Co., Inc., Charlotte, N. C.
Peter Partition Corp., Bklyn, N. Y.
Ross Paper Box Co., New York, N. Y.
Sweetnam, George H. Inc., Cambridge, Mass.
Traver Corp., Chicago, Ill.
Waldorf Paper Products Co., St. Paul, Minn.

PLASTIC MATERIALS, ACRYLATE & METHACRYLATE

Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Rohm & Haas Co., Inc., Phila., Pa.

PLASTIC MATERIALS, ALLYL

American Cyanamid Co., Plastics Div., New York, N. Y.
Goodrich, B. F. Chemical Co., Cleveland, Ohio
Marco Chemicals, Sewaren, N. J.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.

PLASTIC MATERIALS, CASEIN

American Plastics Corp., New York, N. Y.
Hercules Powder Co., Wilmington, Del.
Morrell, George Corp., Muskegon Heights, Mich.
National Casein Sales, Chicago, Ill.

PLASTIC MATERIALS, CAST PHENOLIC

Bakelite Corp., New York, N. Y.
Catalin Corp., New York, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Chemical Plastics, Inc., Minneapolis, Minn.
Durite Plastics, Inc., Phila., Pa.
Eastern Plastics, Inc., Pittsburgh, Pa.
Irvington Varnish & Insulator Co., Irvington, N. J.
Knoedler, A. Co., Lancaster, Pa.
Marblette Corp., The, Long Island City, N. Y.

PLASTIC MATERIALS, CELLULOSE ACETATE

American Products Mfg. Co., New Orleans, La.
American Resinous Chemicals Corp., Peabody, Mass.
Celanese Plastics Corp., New York, N. Y.
Chemaco Corp., Berkeley Heights, N. J.
Davies, Joseph Plastics Co., Arlington, N. J.
Du Pont de Nemours, E. I. & Co., Wilmington, Del.
Eastern Plastics, Inc., Pittsburgh, Pa.
Eastman Kodak Co., Rochester, N. Y.
Hercules Powder Co., Wilmington, Del.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Nixon Nitration Works, Nixon, N. J.
Pyroxylin Products, Inc., Chicago, Ill.
Tennessee Eastman Corp., Kinsport, Tenn.

PLASTIC MATERIALS, CELLULOSE ACETATE BUTYRATE

American Resinous Chemicals Corp., Peabody, Mass.
Pyroxylin Products, Inc., Chicago, Ill.
Tennessee Eastman Corp., Kingsport, Tenn.

PLASTIC MATERIALS, CELLULOSE NITRATE (PYROXYLIN)

American Products Mfg. Co., New Orleans, La.
American Resinous Chemicals Corp., Peabody, Mass.
Davies, Joseph Plastics Co., Arlington, N. J.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Eastman Kodak Co., Rochester, N. Y.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Nixon Nitration Works, Nixon, N. J.

PLASTIC MATERIALS, ETHYL CELLULOSE

American Products Mfg. Co., New Orleans, La.
American Resinous Chemicals Corp., Peabody, Mass.
Celanese Plastics Corp., New York, N. Y.
Chemaco Corp., Berkeley Heights, N. J.
Davies, Joseph Plastics Co., Arlington, N. J.
Dow Chemical Co., The, Midland, Mich.
Hercules Powder Co., Wilmington, Del.
Nixon Nitration Works, Nixon, N. J.
Sylvania Industrial Corp., New York, N. Y.

PLASTIC MATERIALS, MELAMINE

American Cyananid Co., Plastics Div., New York, N. Y.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio

PLASTIC MATERIALS, PHENOLIC

American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Catalin Corp., New York, N. Y.
Chemical Plastics, Inc., Minneapolis, Minn.
Dimco Plastics, Dayton, Ohio
Durez Plastics & Chemicals, Inc., N. Tonawanda, N. Y.
Durite Plastics, Inc., Phila., Pa.
Eastern Plastics, Inc., Pittsburgh, Pa.
Heresite & Chemicals Co., Manitowoc, Wis.
Interlake Chemical Corp., Cleveland, Ohio
Irvington Varnish & Insulator Co., Irvington, N. J.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Reilly Tar & Chemical Corp., Indianapolis, Ind.
Riegel Paper Corp., New York, N. Y.
Synvar Corp., Wilmington, Del.
Varcum Chemical Corp., Niagara Falls, N. Y.

PLASTIC MATERIALS, POLYAMIDE

(Nylon)

Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.

PLASTIC MATERIALS, POLYETHYLENE

American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.

PLASTIC MATERIALS, POLYSTYRENE

American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Catalin Corp., New York, N. Y.
Chemaco Corp., Berkeley Heights, N. J.
Dow Chemical Co., The, Midland, Mich.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Nixon Nitration Works, Nixon, N. J.

PLASTIC MATERIALS, UNSATURATED-POLYESTER

American Resinous Chemicals Corp., Peabody, Mass.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
United States Rubber Co., New York, N. Y.

PLASTIC MATERIALS, UREA

American Cyanamid Co., Plastics Div., New York, N. Y.
American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Dimco Plastics, Dayton, Ohio
Eastern Plastics, Inc., Pittsburgh, Pa.
Interlake Chemical Corp., Cleveland, Ohio
Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio
Reilly Tar & Chemical Corp., Indianapolis, Ind.
Riegel Paper Corp., New York, N. Y.
Sylvania Industrial Corp., New York, N. Y.
Synvar Corp., Wilmington, Del.

PLASTIC MATERIALS, VINYL ACETATE

American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.

PLASTIC MATERIALS, VINYL ALCOHOL

American Resinous Chemicals Corp., Peabody, Mass.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.

PLASTIC MATERIALS, VINYL BUTYRAL

American Anode Inc., Akron, Ohio
American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.

PLASTIC MATERIALS, VINYL CHLORIDE

American Anode Inc., Akron, Ohio
American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Chemaco Corp., Berkeley Heights, N. J.
Goodrich, B. F. Chemical Co., Cleveland, Ohio

PLASTIC MATERIALS, VINYL CHLORIDE ACETATE

American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Carbide & Carbon Chemicals Corp., Plastics Div., New York, N. Y.
Union Carbide & Carbon Corp., New York, N. Y.

PLASTIC MATERIALS, VINYL FORMAL

Monsanto Chemical Co., Plastics Div., Springfield, Mass.

PLASTIC MATERIALS, VINYLIDENE CHLORIDE

American Anode Inc., Akron, Ohio
American Resinous Chemicals Corp., Peabody, Mass.
Dow Chemical Co., The, Midland, Mich.

RIBBONS & TIES, COTTON

Blake, Moffitt & Towne, San Francisco, Calif.
Chicago Printed String Co., Chicago, Ill.
Dennison Mfg. Co., Framingham, Mass.
Economy Novelty & Printing Co., New York, N. Y.
Fibre Cord Co., New York, N. Y.
Freydberg Bros.-Strauss, Inc., New York, N. Y.
Kaplan Products & Textiles, Inc., New York, N. Y.
Stark Bros. Ribbon Co., New York, N. Y.
Taffel Bros., Inc., New York, N. Y.
W-E-R Ribbon Corp., New York, N. Y.

RIBBONS & TIES, RAYON

Artistic Flower Co., New York, N. Y.
Buser, R. G. Corp., Paterson, N. J.
Century Ribbon Mills, New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Du-Tone Ribbon Corp., New York, N. Y.
Economy Novelty & Printing Co., New York, N. Y.
Fibre Cord Co. New York, N. Y.
Freydberg Bros.-Strauss, Inc., New York, N. Y.
General Ribbon Mills, Catasauqua, Pa.
Kaplan Products & Textiles, Inc., New York, N. Y.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Stark Bros. Ribbon Co., New York N. Y.
Taffel Bros., Inc., New York, N. Y.
Welwood, John C., Corp., New York, N. Y.
W-E-R Ribbon Corp., New York, N. Y.
Wright, Wm. E., & Sons Co., West Warren, Mass.

RIBBONS & TIES, TRANSPARENT

Dennison Mfg. Co., Framingham, Mass.
Du-Tone Ribbon Corp., Chicago, Ill.
Fibre Cord Co., New York, N. Y.
Freydberg Bros.-Strauss, Inc., New York, N. Y.
Kaplan Products & Textiles, Inc., New York, N. Y.
Milprint, Inc., Milwaukee, Wis.
Shellmar Products Corp., Mt. Vernon, Ohio
Stark Bros. Ribbon Co., New York, N. Y.
Taffel Bros., Inc., New York, N. Y.
Walser Mfg. Co., Inc., The, Clifton, N. J.
W-E-R Ribbon Corp., New York, N. Y.

ROLL LEAF, STAMPING FOIL

Coughlin Mfg. Co., New York, N. Y.
Griffin, Campbell, Hayes, Walsh, Inc., New York, N. Y.
Markem Machine Co., Keene, N. H.
Peerless Roll Leaf Co., Inc., Union City, N. J.

RUBBER (LATEX), COATINGS & IMPREGNANTS

American Anode Inc., Akron, Ohio
American Resinous Chemicals Corp., Peabody, Mass.
Angier Products, Inc., Cambridge, Mass.
Arabol Mfg. Co., New York, N. Y.
Dewey & Almy Chemical Co., Cambridge, Mass.
Flood & Conklin Mfg., Co., Newark, N. J.
Goodyear Tire & Rubber Co., Akron, Ohio
Midland Glue Products Co., Detroit, Mich.
Paisley Products, Inc., Chicago, Ill.
United States Rubber Co., New York, N. Y.

RUBBER, SPONGE

(Protective Wadding)

Goodyear Tire & Rubber Co., Akron, Ohio
Melind, Louis Co., Chicago, Ill.
Sponge Rubber Prods. Co., The, Shelton, Conn.

RULE, CUTTING & DIE MAKING

Helmold, J. F. & Bros., Inc., Chicago, Ill.

SEALS

(Embossed on Paper, Foil, Etc.)

(See also Closures, Secondary)

Attleboro Printing & Embossing Co., Attleboro, Mass.
Cameo Die & Label Co., New York, N. Y.
Chicago Printed String Co., Chicago, Ill.
Consolidated Lithographing Corp., Bklyn, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Ever Ready Label Corp., New York, N. Y.
Fenton Label Co., Phila., Pa.
Fitzhugh, Wm. W. Inc., Bklyn, N. Y.
Foxon Co., The, Providence, R. I.
French-Bray Printing Co., Baltimore, Md.
Grand Rapids Label Co., Grand Rapids, Mich.
Kaumagraph Co., Wilmington, Del.
Krause, Richard M. Inc., New York, N. Y.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Melind, Louis Co., Chicago, Ill.
Milwaukee Label & Seal Co., Milwaukee, Wis.
Muirson Label Co., Inc., Bklyn, N. Y.
Nalco, Inc., New York, N. Y.
Pacific Label Co., Los Angeles, Calif.
Reyburn Mfg. Co., Inc., The, Phila., Pa.
Reynolds Metals Co., Richmond, Va.
St. Louis Sticker Co., St. Louis, Mo.
Sterling Seal Co., Erie, Pa.
Tablet & Ticket Co., The, Chicago, Ill.
Talmadge Printing Co., New York, N. Y.
Tompkins' Label Service, Phila., Pa.
Unique Printed Products Co., Inc., Terre Haute, Ind.

SHEETING, RIGID TRANSPARENT

Carbide & Carbon Chemicals Corp., Plastics Div., New York, N. Y.
Celanese Plastics Corp., New York, N. Y.
Dow Chemical Co., The, Midland, Mich.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Eastman Kodak Co., Rochester, N. Y.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Union Carbide & Carbon Corp., New York, N. Y.

SHROUDS

(See Liners, Bag, Barrel, Box & Case)

STAPLES, WIRE

Acme Staple Co., Camden, N. J.
Acme Steel Co., Chicago, Ill.
Bates Mfg. Co., The, New York, N. Y.
Bostitch, Inc., East Greenwich, R. I.
Burgess Fastening Co., The, Cleveland, Ohio
Grammes, L. F. & Sons, Inc., Allentown, Pa.
Heller Co., The, Cleveland, Ohio
International Staple & Machine Co., Clifton Heights, Pa.
Mid-States Steel & Wire Co., Crawfordsville, Ind.
Paslode Co., Chicago, Ill.
Seymour & Peck Co., Chicago, Ill.
Signode Steel Strapping Co., Chicago, Ill.

STENCIL BOARD

(Oiled & Unoiled)

Bradley, A. J. Mfg. Co., Long Island City, N. Y.
Cromwell Paper Co., The, Chicago, Ill.
Diagraph-Bradley Stencil Machine Corp., St. Louis, Mo.
Force, Wm. A. & Co., Inc., Bklyn, N. Y.
Garvey Fountain Ink & Brush Co., St. Louis, Mo.
Gottscho, Adolph Inc., New York, N. Y.
Hewitt, C. B. & Bros., Inc., New York, N. Y.
Hummel-Ross Fibre Corp., Hopewell, Va.
Ideal Stencil Machine Co., Belleville, Ill.
Marsh Stencil Machine Co., Belleville, Ill.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Metal Marker Mfg. Co., Cleveland, Ohio
National Waterproofing Co., Camden, N. J.
Nobel & Westbrook Mfg. Co., The, E. Hartford, Conn.
O'Malley, M. J. Co., Springfield, Mass.
Riegel Paper Corp., New York, N. Y.
Schwerdtle Stamp Co., Bridgeport, Conn.

STOPPERS, CORK

(See Corks)

STOPPERS, RUBBER

Pennsylvania Glass Products Co., Pittsburgh, Pa.
United States Rubber Co., New York, N. Y.

STRAPPING, STEEL

Acme Steel Co., Chicago, Ill.
American Steel Band Co., Pittsburgh, Pa.
Gerrard Steel Strapping Co., Chicago, Ill.
Signode Steel Strapping Co., Chicago, Ill.
Stanley Works, The, New Britain, Conn.

STRING, PRINTED

(Plain and Decorative)

Attleboro Printing & Embossing Co., Inc., Attleboro, Mass.
Chicago Printed String Co., Chicago, Ill.
Economy Novelty & Printing Co., New York, N. Y.
Freydberg Bros.-Strauss Inc., New York, N. Y.
Shawprint Inc., Lowell, Mass.

TAGS

Attleboro Printing & Embossing Co., Attleboro, Mass.
Cameo Die & Label Co., New York, N. Y.
Campbell Box & Tag Co., South Bend, Ind.
Cupples-Hesse Corp., St. Louis, Mo.
Dennison Mfg. Co., Framingham, Mass.
Disbrow Mfg. Co., Newark, N. J.
Ever Ready Label Corp., New York, N. Y.
Fox, C. J. Co., The, Providence, R. I.
Foxon Co., The, Providence, R. I.
Grammes, L. F. & Sons, Inc., Allentown, Pa.
Kaumagraph Co., Wilmington, Del.
Milprint, Inc., Milwaukee, Wis.
Reyburn Mfg. Co., Inc., The, Phila., Pa.
Robinson Tag & Label Co., New York, N. Y.
Salisbury Mfg. Co., Central Falls, R. I.
Sterling Offset Co., New York, N. Y
Talmadge Printing Co., New York, N. Y.
Weber Addressing Machine Co., Chicago, Ill.

Addresses of companies listed appear on pages 1022–1033

XUM

TAPE, CELLULOSE

Cofax Corp., The, Lynbrook, N. Y.
Dobeckmun Co., The, Cleveland, Ohio
Gummed Tape & Devices Co., Bklyn, N. Y.
Industrial Tape Corp., New Brunswick, N. J.
International Plastic Corp., Morristown, N. J.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Walser Mfg. Co., Inc., The, Clifton, N. J.

TAPE, COTTON

Blake, Moffitt & Towne, San Francisco, Calif.
Chicago Printed String Co., Chicago, Ill.
Fibre Cord Co., New York, N. Y.
General Printed String Co., Milwaukee, Wis.

TAPE, GUMMED

Angier Corp., Framingham, Mass.
Atlantic Gummed Paper Corp., Bklyn, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Brown-Bridge Mills, Inc., The, Troy, Ohio
Central Paper Co., Menasha, Wis.
Chicago Gum Tape Co., Chicago, Ill.
Crowell Corp., The, Yorklyn, Del.
Crown Zellerbach Corp., San Francisco, Calif.
Dennison Mfg. Co., Framingham, Mass.
Disbrow Mfg. Co., Newark, N. J.
Economy Novelty & Printing Co., New York, N. Y.
Ever Ready Label Corp., New York, N. Y.
Fort Wayne Corrugated Paper Co., Fort Wayne, Ind.
Gates Paper Co. Ltd., The, Los Angeles, Calif.
Gummed Products Co., The, Troy, Ohio
Gummed Tape & Devices Co., Bklyn, N. Y.
Knowlton, M. D. Co., Rochester, N. Y.
Leeds Sales Co., Inc., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Merchant Suppliers Paper Co., New York, N. Y.
Mid-States Gummed Paper Co., Chicago, Ill.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Rexford Paper Co., Milwaukee, Wis.
Salwen, Joe Paper Products Corp., New York, N. Y.
Tanglefoot Co., The, Grand Rapids, Mich.
Western Waxed Paper Co., Los Angeles, Calif.

TAPE, HEAT SEALING

Dennison Mfg. Co., Framingham, Mass.
Irvington Varnish & Insulator Co., Irvington, N. J.
Leeds Sales Co., Inc., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
Pyroxylin Products, Inc., Chicago, Ill.
Tompkins' Label Service, Phila., Pa.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.

TAPE, PRESSURE SENSITIVE

(Self-Sealing)

Bauer & Black Div. of The Kendall Co., Chicago, Ill.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Cofax Corp., Lynbrook, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Ever Ready Label Corp., New York, N. Y.
Freydberg Bros.-Strauss, Inc., New York, N. Y.
Gummed Tape & Devices Co., Bklyn, N. Y.
Heaphy, Charles F. Co., New York, N. Y.
Industrial Tape Corp., New Brunswick, N. J.
International Plastic Corp., Morristown, N. J.
Leeds Sales Co., Inc., New York, N. Y.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Reynolds Metals Co., Richmond, Va.

TAPE, WATER RESISTANT

Angier Corp., Framingham, Mass.
Atlantic Gummed Paper Corp., Bklyn, N. Y.
Bakelite Corp., New York, N. Y.
Bauer & Black Div. of The Kendall Co., Chicago, Ill.
Blake, Moffitt & Towne, San Francisco, Calif.
Bradner Smith & Co., Chicago, Ill.
Central Paper Co., Menasha, Wis.
Gummed Products Co., The, Troy, Ohio
Gummed Tape & Devices Co., Bklyn, N. Y.
Hinkson Paper Co., Palmer, Mass.
International Plastic Corp., Morristown, N. J.
Leeds Sales Co., Inc., New York, N. Y.
Matthias Paper Corp., Phila., Pa.
McLaurin-Jones Co., Brookfield, Mass.
Mid-States Gummed Paper Co., Chicago, Ill.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
Rexford Paper Co., Milwaukee, Wis.
United States Rubber Co., New York, N. Y.

TAPE, WIRE REINFORCED

Germain's, Los Angeles, Calif.

TINPLATE

Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Republic Steel Corp., Cleveland, Ohio

TRANSPARENT FILMS, CELLOPHANE

Aldine Paper Co., Inc., New York, N. Y.
Blake, Moffitt & Towne, San Francisco, Calif.
Crystal Transparent Corp., New York, N. Y.
Daniels Mfg. Co., Rhinelander, Wis.
Dennison Mfg. Co., Framingham, Mass.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Sylvania Industrial Corp., New York, N. Y.
Tower Envelope Co., New York, N. Y.

TRANSPARENT FILMS, CELLULOSE ACETATE

American Products Mfg. Co., New Orleans, La.
Celanese Plastics Corp., New York, N. Y.
Crystal Transparent Corp., New York, N. Y.
Daniels Mfg. Co., Rhinelander, Wis.
Davies, Joseph Plastics Co., Arlington, N. J.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.
Eastman Kodak Co., Rochester, N. Y.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
Nixon Nitration Works, Nixon, N. J.

TRANSPARENT FILMS, ETHYL CELLULOSE

American Products Mfg. Co., New Orleans, La.
Celanese Plastics Corp., New York, N. Y.
Davies, Joseph Plastics Co., Arlington, N. J.
Dow Chemical Co., The, Midland, Mich.

TRANSPARENT FILMS, GLASSINE

(Lacquer-Coated)

Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Twitchell, E. W. Inc., Packaging Div., Phila., Pa.
Westfield River Paper Co., Inc., Russell, Mass.

TRANSPARENT FILMS, LATEX FOR WRAPPING FROZEN FOODS

Dewey & Almy Chemical Co., Cambridge, Mass.
United States Rubber Co., New York, N. Y.

TRANSPARENT FILMS, POLYETHYLENE

Bakelite Corp., New York, N. Y.
Gordon-Lacey Chemical Products Co., Inc., Maspeth, L. I., N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Visking Corp., The, Chicago, Ill.

TRANSPARENT FILMS, RUBBER HYDROCHLORIDE

Goodyear Tire & Rubber Co., Akron, Ohio

TRANSPARENT FILMS, VINYL ACETATE

Carbide & Carbon Chemicals Corp., New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.

TRANSPARENT FILMS, VINYL ALCOHOL

Du Pont de Nemours, E. I. & Co., Inc., Wilmington, Del.

TRANSPARENT FILMS, VINYL BUTYRAL

Bakelite Corp., New York, N. Y.
Gordon-Lacey Chemical Products Co., Inc., Maspeth, L. I., N. Y.
Monsanto Chemical Co., Plastics Div., Springfield, Mass.

TRANSPARENT FILMS, VINYL CHLORIDE

Bakelite Corp., New York, N. Y.
Goodyear Tire & Rubber Co., Akron, Ohio

TRANSPARENT FILMS, VINYL CHLORIDE ACETATE

American Resinous Chemicals Corp., Peabody, Mass.
Bakelite Corp., New York, N. Y.
Celanese Plastics Corp., New York, N. Y.
Gordon-Lacey Chemical Products Co., Inc., Maspeth, L. I., N. Y.

TRANSPARENT FILMS, VINYLIDENE CHLORIDE

Carbide & Carbon Chemicals Corp., Plastics Div., New York, N. Y.
Dow Chemical Co., The, Midland, Mich.

Bold-face listings indicate advertisers in this issue

TUBE CLIPS

Colton, Arthur Co., Detroit, Mich.
Standard Specialty & Tube Co., New Brighton, Pa.

TUBING, GLASS

(See Glass, Rod & Tubing)

VARNISHES & LACQUERS

(See Coatings, Protective)

WADDING

(See Padding & Wadding)

WAX, COATING, LAMINATING, SEALING

American Resinous Chemicals Corp., Peabody, Mass.
Angier Products, Inc., Cambridge, Mass.
Bareco Oil Co., Tulsa, Okla.
Dennison Mfg. Co., Framingham, Mass.
Dewey & Almy Chemical Co., Cambridge, Mass.
General Felt Products, Div. Standard Cap & Seal Corp., Bklyn, N. Y.
Glyco Products Co., Inc., Bklyn, N. Y.
Goodyear Tire & Rubber Co., Akron, Ohio
Holes, Floyd A. Co., The, Bedford, Ohio
Houghton, E. F. & Co., Phila., Pa.
Kehr Paper Products Co., Phila., Pa.
Loroco Industries, Inc., Reading, Ohio
Natl. Oil Products Co., Harrison, N. J.
Non-Rust Corp., Chicago, Ill.
Paisley Products, Inc., Chicago, Ill.
Petroleum Specialties, Inc., New York, N. Y.
Petrolite Corp., Ltd., New York, N. Y.
Powers Products, Inc., Chicago, Ill.
Protective Packaging Corp., Newark, N. J.
Pyroxylin Products, Inc., Chicago, Ill.
Single Service Containers, Inc., New York, N. Y.
Socony-Vacuum Oil Co., Inc., New York, N. Y.
Specialty Papers Co., The, Dayton, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Zophar Mills, Inc., Bklyn, N. Y.

WIRE, REINFORCEMENT

Acme Steel Co., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Gerrard Steel Strapping Co., Chicago, Ill.

WIRE, STAPLING

Acme Staple Co., Camden, N. J.
Acme Steel Co., Chicago, Ill.
Bates Mfg. Co., The, New York, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Bostitch, Inc., E. Greenwich, R. I.
Burgess Fastening Co., The, Cleveland, Ohio
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Mid-States Steel & Wire Co., Crawfordsville, Ind.
Paslode Co., Chicago, Ill.
Single Service Containers, Inc., New York, N. Y.

WIRE, STITCHING

Acme Steel Co., Chicago, Ill.
Bethlehem Steel Co., Bethlehem, Pa.
Bostitch, Inc., E. Greenwich, R. I.
Burgess Fastening Co., The, Cleveland, Ohio
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Mid-States Steel & Wire Co., Crawfordsville, Ind.
Paslode Co., Chicago, Ill.
Prentiss, George W. & Co., Holyoke, Mass.

WIRE, STITCHING, COLORED

Acme Steel Co., Chicago, Ill.
Bostitch, Inc., E. Greenwich, R. I.

WRAPPERS

(See Labels & Wrappers)

WRAPPINGS

Ben Mont Papers, Inc., Bennington, Vt.
Bradner Smith & Co., Chicago, Ill.
Central Ohio Paper Co., The, Columbus, Ohio
Central Waxed Paper Co., Chicago, Ill.
Chicago Paper Co., Chicago, Ill.
Chicago Printed String Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Criterion Paper Corp., New York, N. Y.
Crystal Tissue Co., The, Middletown, Ohio
Crystal Transparent Corp., New York, N. Y.
Dobeckmun Co., The, Cleveland, Ohio
Ever Ready Label Corp., New York, N. Y.
Kaumagraph Co., Wilmington, Del.
Matthias Paper Corp., Phila., Pa.
Milprint, Inc., Milwaukee, Wis.
Minnesota Mining & Mfg. Co., St. Paul, Minn.
National Water-Proofing Co., Camden, N. J.
Reynolds Metals Co., Richmond, Va.
Rhinelander Paper Co., Rhinelander, Wis.
Riegel Paper Corp., New York, N. Y.
Roesch, Louis Co., San Francisco, Calif.
Shellmar Products Corp., Mt. Vernon, Ohio
Stecher-Traung Litho. Corp., Rochester, N. Y.
Sylvania Industrial Corp., New York, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tuttle Press Co., The, Appleton, Wis.

Container Manufacturers Section

AMPULS, GLASS

Glass Industries, Inc., New York, N. Y.
Kimble Glass Co., Vineland, N. J.
Price, M. B. Associates, New York, N. Y.
Wheaton, T. C. Co., Millville, N. J.

BAGS, ANTI-TARNISH

(Cloth and Cotton-Lined Paper)

Andrews, P. L. Corp., Bklyn, N. Y.
Cottonluxe Mfg. Co., New York, N. Y.
Cupples-Hesse Corp., St. Louis, Mo.
Eureka Mfg. Co., Inc., Taunton, Mass.
Paramount Paper Products Co., Inc., Phila., Pa.
Trilsch, Oscar Co., Whitestone, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Varey-Shea Bag Corp., Elizabeth, N. J.

BAGS, FOIL

Betner, Benj. C. Co., Devon, Pa.
Cadillac Products, Inc., Detroit, Mich.
Cromwell Paper Co., Chicago, Ill.
Diaphane Bag Corp. of Pa., Phila., Pa.
Dobeckmun Co., The, Cleveland, Ohio
Hi-Land Paper Products Co., Ossining, N. Y.
Interstate Folding Box Co., The, Middletown, Ohio
Kehr Paper Products Co., Phila., Pa.
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Leeds Sales Co., Inc., New York, N. Y.
Mehl Mfg. Co., Cincinnati, Ohio
Milprint, Inc., Milwaukee, Wis.
Modern Containers Co., Los Angeles, Calif.
Moist-R-Proof Container Co., San Francisco, Calif.
Newark Glassine Bag Co., Newark, N. J.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Paramount Paper Products Co. Inc., Phila., Pa.
Protective Packaging Corp., Newark, N. J.
Reynolds Metals Co., Richmond, Va.
Royal, Thomas M. & Co., Phila., Pa.
Shaw-Randall Co., Pawtucket, R. I.
Shellmar Products Corp., Mt. Vernon, Ohio
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Traver Corp., Chicago, Ill.
Triangle Paper Bag Mfg. Co., The, Covington, Ky.
Union Bag & Paper Corp., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.

BAGS, GLASSINE & WAXED

American Paper Goods Co., The, Kensington, Conn.
Arkell & Smiths, Canajoharie, N. Y.
Beier & Co., Chicago, Ill.
Betner, Benj. C. Co., Devon, Pa.
Brooklyn Standard Bag Corp., New York, N. Y.
Central Waxed Paper Co., Chicago, Ill.
Colonial Envelope Co., New York, N. Y.
Comet Envelope & Paper Co., Inc., New York, N. Y.
Consolidated Paper Bag Co., Somerville, Mass.
Continental Bag Specialties Corp., New York, N. Y.
Cromwell Paper Co., Chicago, Ill.
Crystal Tube Corp., Chicago, Ill.
Cupples-Hesse Corp., St. Louis, Mo.
Diaphane Bag Corp. of Pa., Phila., Pa.
Disbrow Mfg. Co., Inc., The, Newark, N. J.
Dixie Wax Paper Co., Dallas, Texas
Equitable Paper Bag Co., Inc., Long Island City, N. Y.
Hi-Land Paper Products Co., Ossining, N. Y.
Interstate Folding Box Co., The, Middletown, Ohio
Kehr Paper Products Co., Phila., Pa.
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Leeds Sales Co., Inc., New York, N. Y.
Marathon Corp., Menasha, Wis.
Mason Envelope Co., Inc., New York, N. Y.
Mehl Mfg. Co., Cincinnati, Ohio
Miller & Miller, Atlanta, Ga.
Milprint, Inc., Milwaukee, Wis.
Modern Containers, Inc., Los Angeles, Calif.
Moser Bag & Paper Co., Cleveland, Ohio

Addresses of companies listed appear on pages 1022–1033

XUM

Newark Glassine Bag Co., Newark, N. J.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Oneida Paper Products, Inc., New York, N. Y.
Paramount Paper Products Co., Inc., Phila., Pa.
Pollock Paper & Box Co., Dallas, Texas
Royal, Thomas M. & Co., Phila., Pa.
St. Regis Paper Co., New York, N. Y.
Schorsch & Co., Inc., New York, N. Y.
Shawmut Waxed Paper Co., Holliston, Mass.
Shellmar Products Corp., Mt. Vernon, Ohio
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tower Envelope Co., New York, N. Y.
Triangle Paper Bag Mfg. Co., The, Covington, Ky.
Union Bag & Paper Corp., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Wolf Bros., Phila., Pa.
Yorkville Paper Co., Inc., New York, N. Y.

BAGS, GLASSINE-LAMINATED & DUPLEX

American Paper Goods Co., The, Kensington, Conn.
Beier & Co., Chicago, Ill.
Betner, Benj. C. Co., Devon, Pa.
Brooklyn Standard Bag Corp., New York, N. Y.
Cadillac Products, Inc., Detroit, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Continental Bag Specialties Corp., New York, N. Y.
Cupples-Hesse Corp., St. Louis, Mo.
Disbrow Mfg. Co. Inc., The, Newark, N. J.
Equitable Paper Bag Co., Inc., Long Island City, N. Y.
Hi-Land Paper Products Co., Ossining, N. Y.
Interstate Folding Box Co., The, Middletown, Ohio
Kehr Paper Products Co., Phila., Pa.
Marathon Corp., Menasha, Wis.
Mason Envelope Co., Inc., New York, N. Y.
Mehl Mfg. Co., Cincinnati, Ohio
Miller & Miller, Atlanta, Ga.
Milprint, Inc., Milwaukee, Wis.
Moser Bag & Paper Co., Cleveland, Ohio
Newark Glassine Bag Co., Newark, N. J.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Oneida Paper Products, Inc., New York, N. Y.
Paramount Paper Products Co., Inc., Phila., Pa.
Royal, Thomas M. & Co., Phila., Pa.
Schorsch & Co., Inc., New York, N. Y.
Shellmar Products Corp., Mt. Vernon, Ohio
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tower Envelope Co., New York, N. Y.
Traver Corp., Chicago, Ill.
Union Bag & Paper Corp., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.

BAGS, KRAFT, GROCERY

Atlanta Paper Co., Atlanta, Ga.
Brooklyn Standard Bag Corp., New York, N. Y.
Consolidated Paper Bag Co., Somerville, Mass.
Crown-Willamette Paper Co., San Francisco, Calif.
Crunden, Martin Mfg. Co., St. Louis, Mo.
Cupples Co., St. Louis, Mo.
Gaylord Container Corp., St. Louis, Mo.
Glickman, L. & Co., Bklyn, N. Y.
Interstate Bag Co., Walden, N. Y.
Kraft Bag Corp., New York, N. Y.
Lenoir Pad & Paper Co., Lenoir, N. C.
Merchant Suppliers Paper Co., New York, N. Y.
Pine-Land Bag Corp., Inc., Pascagoula, Miss.
Raymond Bag Co., Middletown, Ohio
St. Regis Paper Co., New York, N. Y.
Schorsch & Co., Inc., New York, N. Y.
Security Bag Co., The Cincinnati, Ohio
Seinsheimer Paper Corp., Cincinnati, Ohio
Stevens, C. E. Bros., Inc., Baltimore, Md.
Superior-Lawrence Bag Co., Inc., New York, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Triangle Paper Bag Mfg. Co., The, Covington, Ky.
Union Bag & Paper Corp., New York, N. Y.
Wortendyke Mfg. Co., Richmond, Va.

BAGS, MULTIWALL HEAVY DUTY

American-National Bag & Burlap Co.,Inc., Bklyn, N. Y.
Arkell & Smiths, Canajoharie, N. Y.
Bagpak, Inc., New York, N. Y.
Bemis Bro. Bag Co., St. Louis, Mo.
Brooklyn Standard Bag Corp., New York, N. Y.
Chase Bag Co., Chicago, Ill.
Cromwell Paper Co., The, Chicago, Ill.
Equitable Paper Bag Co., Inc., Long Island City, N. Y.
George & Sherrard Paper Co., New York, N. Y.
Hollingsworth & Whitney Co., Boston, Mass.
International Paper Prods., Div. of International Paper Co., New York, N. Y.
Kraft Bag Corp., New York, N. Y.
Maine Potato Bag Co., Caribou, Maine
Premier Bag Co., Lyndhurst, N. J.
Raymond Bag Co., The, Middletown, Ohio
Reynolds Metals Co., Richmond, Va.
St. Regis Paper Co., New York, N. Y.
Schorsch & Co., Inc., New York, N. Y.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Triangle Paper Bag Mfg. Co., The, Covington, Ky.
Union Bag & Paper Corp., New York, N. Y.
Wortendyke Mfg. Co., The, Richmond, Va.
Yorkville Paper Co., Inc., New York, N. Y.

BAGS, OPEN MESH

Bemis Bro. Bag Co., St. Louis, Mo.
Brown & Brown, Mobile, Ala.
Chase Bag Co., Chicago, Ill.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Hardin Bag & Burlap Co., Inc., The, New Orleans, La.
Mente & Co., Inc., New Orleans, La.
Noon Bag Co., Portland, Ore.
Premier Bag Co., Lyndhurst, N. J.
Ullmann Bag Co., Detroit, Mich.

BAGS, TEXTILE

Acme Burlap Bag Co., Bklyn, N. Y.
American National Bag & Burlap Co., Inc., Bklyn, N. Y.
Ames Bag Co., Cleveland, Ohio
Ames Harris Neville Co., San Francisco, Calif.
Arkell Safety Bag Co., New York, N. Y.
Augusta Bag & Burlap Co., Augusta, Ga.
Bader Bros. Bag Co., Detroit, Mich.
Bannon Bag Co., The, New Orleans, La.
Bemis Bro. Bag Co., St. Louis, Mo.
Boldt Bag Co., The, Houston, Texas
Bosworth, M. M. Co., Memphis, Tenn.
Brown & Brown, Mobile, Ala.
Burka Bag Co. of Texas, Galveston, Texas
Central Bag & Burlap Co., Chicago, Ill.
Chase Bag Co., Chicago, Ill.
Chase, H. & L., Boston, Mass.
Cincinnati Industries, Inc., Cincinnati, Ohio
Cottonluxe Mfg. Co., New York, N. Y.
Crescent Burlap Bag Co., New Orleans, La.
Crystal Bag Co., Chickamauga, Ga.
Erwin Bag Co., Houston, Texas
Friedman Bag Co., Los Angeles, Calif.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Gallie-King Bag Co., Houston, Texas
General Bag Corp., Cleveland, Ohio
Grafflin Bag Co., Inc., Baltimore, Md.
Grimes Co., The, Denver, Colo.
Halsted, E. S. & Co., Inc., New York, N. Y.
Hardin Bag & Burlap Co., Inc., The, New Orleans, La.
Hutchinson Bag Co., Hutchinson, Kan.
Kent, Percy Bag Co., New York, N. Y.
Keystone Bag & Burlap Co., Lancaster, Pa.
King Bag Co., Cincinnati, Ohio
King Mfg. Co., Cincinnati, Ohio
Lawson, Jacob Bag Co., New York, N. Y.
Lone Star Bag & Bagging Co., Houston, Texas
Maine Potato Bag Co., Caribou, Maine
Mason Envelope Co., Inc., New York, N. Y.
Mente & Co., Inc., New Orleans, La.
Midland Bag, Inc., Cleveland, Ohio
Millhiser Bag Co., Richmond, Va.
Milprint, Inc., Milwaukee, Wis.
Missouri Bag Co., St. Louis, Mo.
Morgan Bros., Richmond, Va.
National Bag Corp., New York, N. Y.
Neahr, M. J. & Co., Chicago, Ill.
Noon Bag Co., Portland, Ore.
Northeastern Bag & Burlap Co., New York, N. Y.
Pacific Diamond H Bag Co., San Francisco, Calif.
Premier Bag Co., Lyndhurst, N. J.
Producers Dealers Supply Co., Boston, Mass.
Progressive Bag Co., Inc., New Haven, Conn.
Sacramento Bag Mfg. Co., Sacramento, Calif.
Southern California Bag Co., Los Angeles, Calif.
Southern States Bag Co., Jacksonville, Fla.
Sprosty, Dan A. Bag Co., Baltimore, Md.
Sterling Bag Co., Bklyn, N. Y.
Sterling Bag Co., Inc., New York, N. Y.
Tobias, Max N. Bag Co., New Orleans, La.
Ullmann Bag Co., Detroit, Mich.
Varey-Shea Bag Corp., Elizabeth, N. J.
Virginia Carolina Chemical Co., Richmond, Va.
Walker Bag Co., Louisville, Ky.
Werthan Bag Corp., Nashville, Tenn.
Wertheimer Bag Co., Wilmington, N. C.
West Coast Bags, Inc., Los Angeles, Calif.
Woodward Bag Co., Augusta, Ga.

BAGS, TRANSPARENT

(Cellulosic)

American Paper Goods Co., The, Kensington, Conn.
Automatic Box Co., New York, N. Y.
Brooks Paper Co., St. Louis, Mo.
Cadillac Products, Inc., Detroit, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Colonial Envelope Co., New York, N. Y.
Comet Envelope & Paper Co., Inc., New York, N. Y.
Continental Bag Specialties Corp., New York, N. Y.
Crystal Transparent Corp., New York, N. Y.
Crystal Tube Corp., Chicago, Ill.
Cupples-Hesse Corp., St. Louis, Mo.
Design Center Inc., Flushing, L. I., N. Y.
Diaphane Bag Corp. of Pa., Phila., Pa.

Disbrow Mfg. Co. Inc., The, Newark, N. J.
Dobeckmun Co., The, Cleveland, Ohio
Equitable Paper Bag Co., Inc., Long Island City, N. Y.
Hi-Land Paper Products Co., Ossining, N. Y.
Humitube Mfg. Co., Peoria, Ill.
Interstate Folding Box Co., The, Middletown, Ohio
Kehr Paper Products Co., Phila., Pa.
Kennedy Car Liner & Bag Co., Inc , Shelbyville, Ind.
Mason Envelope Co., Inc., New York, N. Y.
Mehl Mfg. Co., Cincinnati, Ohio
Milprint, Inc., Milwaukee, Wis.
Modern Containers Co., Los Angeles, Calif.
Moist-R-Proof Container Co., San Francisco, Calif.
Moser Bag & Paper Co., Cleveland, Ohio
Munson Bag Co., The, Cleveland, Ohio
National Transparent Plastics Co., Springfield, Mass.
Neostyle, Inc., Chicago, Ill.
Newark Glassine Bag Co., Newark, N. J.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Oneida Paper Products, Inc., New York, N. Y.
Paramount Paper Products Co., Inc., Phila., Pa.
Pollock Paper & Box Co., Dallas, Texas
Print-A-Tube Co., Passaic, N. J.
Read, F. A. Inc., Albion, N. Y.
Royal, Thomas M. & Co., Phila, Pa.
Shawmut Waxed Paper Co., Holliston, Mass.
Shellmar Products Corp., Mt. Vernon, Ohio
Texas Paper Box Mfg. Co., Dallas, Texas
Tower Envelope Co., New York, N. Y.
Trans-Pac Services, Inc., New York, N. Y.
Traver Corp., Chicago, Ill.
Union Bag & Paper Corp., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Visking Corp., The, Chicago, Ill.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.
Wolf Bros., Phila., Pa.

BAGS, WATERPROOF

Angier Corp., Framingham, Mass.
Beier & Co., Chicago, Ill.
Bemis Bro. Bag Co., St. Louis, Mo.
Brooklyn Standard Bag Corp., New York, N. Y.
Cadillac Products, Inc., Detroit, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Chase Bag Co., Chicago, Ill.
Cincinnati Industries, Inc., Cincinnati, Ohio
Clarvan Corp., Milwaukee, Wis.
Continental Bag Specialties Corp., New York, N. Y.
Cromwell Paper Co., The, Chicago, Ill.
Disbrow Mfg. Co., Inc., The, Newark, N. J.
Dobeckmun Co., The, Cleveland, Ohio
Equitable Paper Bag Co., Inc., Long Island City, N. Y.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Heaphy, Charles F. Co., New York, N. Y.
Interstate Folding Box Co., Middletown, Ohio
Kehr Paper Products Co., Phila., Pa.
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Mason Envelope Co., Inc., New York, N. Y.
Mehl Mfg. Co., Cincinnati, Ohio
Merchant Suppliers Paper Co., New York, N. Y.
Milprint, Inc., Milwaukee, Wis.
Moist-R-Proof Container Co., San Francisco, Calif.
National Transparent Plastics Co., Springfield, Mass.
National Water-Proofing Co., Camden, N. J.
Neostyle, Inc., Chicago, Ill.
Oneida Paper Products, Inc., New York, N. Y.
Paramount Paper Products Co., Inc., Phila., Pa.
Print-A-Tube Co., Passaic, N. J.
Protective Coatings Corp., Belleville, N. J.
Ralston, W. & Co., Inc., Niagara Falls, N. Y.
Raymond Bag Co., The, Middletown, Ohio
Shellmar Products Corp., Mt. Vernon, Ohio
Sisalkraft Co., The, Chicago, Ill.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Traver Corp., Chicago, Ill.
Union Bag & Paper Corp., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Visking Corp., The, Chicago, Ill.
Western Waxed Paper Co., Los Angeles, Calif.

BAGS, WINDOW

Automatic Box Co., New York, N. Y.
Continental Bag Specialties Corp., New York, N. Y.
Cupples-Hesse Corp., St. Louis, Mo.
Hi-Land Paper Products Co., Ossining, N. Y.
Interstate Folding Box Co., Middletown, Ohio
Kehr Paper Products Co., Phila., Pa.
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Mason Envelope Co., Inc., New York, N. Y.
Milprint, Inc., Milwaukee, Wis.
Newark Glassine Bag Co., Newark, N. J.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Oneida Paper Products, Inc., New York, N. Y.
Paramount Paper Products Co., Inc., Phila., Pa.
Read, F. A. Inc., Albion, N. Y.
Royal, Thomas M. & Co., Phila., Pa.
Union Bag & Paper Corp., New York, N. Y.

BOTTLES, ALUMINUM

American Aluminum Ware Co., Newark, N. J.
Seal-Spout Corp., Newark, N. J.

BOTTLES, BEVERAGE

Anchor Hocking Glass Corp., Lancaster, Ohio
Armstrong Cork Co., Lancaster, Pa.
Ball Brothers Co., Muncie, Ind.
Berman Bros., Inc., Chicago, Ill.
Braun, W. Co., Chicago, Ill.
Brockway Glass Co., Inc., Brockway, Pa.
Buck Glass Co., The, Baltimore, Md.
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Containers, Inc., Los Angeles, Calif.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Liberty Glass Co., Sapulpa, Okla.
Olean Glass Co., Olean, N. Y.
Owens-Illinois Glass Co., Toledo, Ohio
Sager Bros., New York, N. Y.
Swindell Bros., Baltimore, Md.
Thatcher Mfg. Co., Elmira, N. Y.

BOTTLES, FOOD PACKING

Anchor Hocking Glass Corp., Lancaster, Ohio
Armstrong Cork Co., Lancaster, Pa.
Ball Brothers Co., Muncie, Ind.
Berman Bros., Inc., Chicago, Ill.
Blake, Moffitt & Towne, San Francisco, Calif.
Braun, W. Co., Chicago, Ill.
Brockway Glass Co., Inc., Brockway, Pa.
Carr-Lowrey Glass Co., Baltimore, Md.
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Containers, Inc., Los Angeles, Calif.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Olean Glass Co., Olean, N. Y.
Owens-Illinois Glass Co., Toledo, Ohio
Thatcher Mfg. Co., Elmira, N. Y.

BOTTLES, HAND MADE

Braun, W. Co., Chicago, Ill.
Carr-Lowrey Glass Co., Baltimore, Md.
Corning Glass Works, Corning, N. Y.
Glass Industries, Inc., New York, N. Y.
Kimble Glass Co., Vineland, N. J.
Swindell Bros., Baltimore, Md.
Wheaton, T. C. Co., Millville, N. J.

BOTTLES, MILK

Blake, Moffitt & Towne, San Francisco, Calif.
Buck Glass Co., The, Baltimore, Md.
Liberty Glass Co., Sapulpa, Okla.
Owens-Illinois Glass Co., Toledo, Ohio
Thatcher Mfg. Co., Elmira, N. Y.

BOTTLES, MINIATURE

Braun, W. Co., Chicago, Ill.
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Industries, Inc., New York, N. Y.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Sager Bros., New York, N. Y.

BOTTLES, PLASTIC

Celluplastic Corp., Newark, N. J.
Columbus Plastic Products, Columbus, Ohio
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Design Center Inc., Flushing, L. I., N. Y.
Lusteroid Container Co., Inc., S. Orange, N. J.
Northern Industrial Chemical Co., S. Boston, Mass.
Owens-Illinois Glass Co., Toledo, Ohio
Plax Corp., Hartford, Conn.
Pro-phy-lac-tic Brush Co., The, Prolon Div., Florence, Mass.

BOTTLES, PROPRIETARY & PRESCRIPTION

Anchor Hocking Glass Corp., Lancaster, Ohio
Armstrong Cork Co., Lancaster, Pa.
Ball Brothers Co., Muncie, Ind.
Berman Bros., Inc., Chicago, Ill.
Braun, W. Co., Chicago, Ill.
Brockway Glass Co., Inc., Brockway, Pa.
Buck Glass Co., The, Baltimore, Md.
Carr-Lowrey Glass Co., Baltimore, Md.
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Containers, Inc., Los Angeles, Calif.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Maryland Glass Corp., Baltimore, Md.
Owens-Illinois Glass Co., Toledo, Ohio
Pennsylvania Glass Products Co., Pittsburgh, Pa.
Sager Bros., New York, N. Y.
Swindell Bros., Baltimore, Md.
Thatcher Mfg. Co., Elmira, N. Y.
Wheaton, T. C. Co., Millville, N. J.

BOTTLES, SERUM

Berman Bros., Inc., Chicago, Ill.
Corning Glass Works, Corning, N. Y.
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Industries, Inc., New York, N. Y.
Kimble Glass Co., Vineland, N. J.
Owens-Illinois Glass Co., Toledo, Ohio

BOTTLES, TOILET, PERFUME, COSMETIC

Anchor Hocking Glass Corp., Lancaster, Ohio
Armstrong Cork Co., Lancaster, Pa.

Ball Brothers Co., Muncie, Ind.
Berman Bros., Inc., Chicago, Ill.
Braun, W. Co., Chicago, Ill.
Brockway Glass Co., Inc., Brockway, Pa.
Carr-Lowrey Glass Co., Baltimore, Md.
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Containers, Inc., Los Angeles, Calif.
Glass Industries, Inc., New York, N. Y.
Hamilton, J. T. & A. Co., Pittsburgh, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Kimble Glass Co., Vineland, N. J.
Maryland Glass Corp., Baltimore, Md.
Owens-Illinois Glass Co., Toledo, Ohio
Sager Bros., New York, N. Y.
Seal-Spout Corp., Newark, N. J.
Swindell Bros., Baltimore, Md.
Wheaton, T. C. Co., Millville, N. J.

BOTTLES & JARS, APPLIED COLOR

Anchor Hocking Glass Corp., Lancaster, Ohio
Anigraphic Process, Inc., New York, N. Y.
Ball Brothers Co., Muncie, Ind.
Berman Bros., Inc., Chicago, Ill.
Braun, W. Co., Chicago, Ill.
Brockway Glass Co., Brockway, Pa.
Buck Glass Co., The, Baltimore, Md.
Carr-Lowrey Glass Co., Baltimore, Md.
Ceramic Decorating Co., Los Angeles, Calif.
Coloroid Co., Inc., Cleveland, Ohio
Double Duty Products, Inc., Cleveland, Ohio
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Containers, Inc., Los Angeles, Calif.
Glass Industries, Inc., New York, N. Y.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Liberty Glass Co., Sapulpa, Okla.
Owens-Illinois Glass Co., Toledo, Ohio
Swindell Bros., Baltimore, Md.
Wheaton, T. C. Co., Millville, N. J.

BOXES, CORRUGATED & SOLID FIBRE

Abana Products, Chicago, Ill.
American Box Board Co., Chicago, Ill.
American Coating Mills, Inc., Elkhart, Ind.
Anderson Box & Basket Co., Inc., New York, N. Y.
Andrews, O. B Co., Chattanooga, Tenn.
Arvey Corp., Chicago, Ill.
Ashtabula Corrugated Box Co., The, Ashtabula, Ohio
Atlanta Paper Co., Atlanta, Ga.
Atlas Boxmakers, Inc., Chicago, Ill.
Bird & Son, Inc., East Walpole, Mass.
Birmingham Paper Co., Birmingham, Ala.
Carpenter Container Corp., Bklyn, N. Y.
Columbia Paper Box Co., Washington, D. C.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Chicago, Ill.
Continental Container Corp., Bklyn, N. Y.
Crescent Box Corp., Phila., Pa.
Crook Paper Box Co., Kansas City, Mo.
Danbury Square Box Co., Danbury, Conn.
Eddy Paper Corp., The, Chicago, Ill.
Eggerss O'Flying Co., Omaha, Nebr.
Excelsior Paper Specialties Co., New York, N. Y.
Federal Container Co., Phila., Pa.
Fibreboard Products, Inc., San Francisco, Calif.
Fort Wayne Corrugated Paper Co., Fort Wayne, Ind.
Gair, Robert Co., Inc., New York, N. Y.
Gaylord Container Corp., St. Louis, Mo.
Grand City Container Corp., New York, N. Y.
Hankins Container Co., Cleveland, Ohio
Hinde & Dauch Paper Co., The, Sandusky, Ohio
Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
Hummel & Downing Co., Milwaukee, Wis.
Inland Container Corp., Indianapolis, Ind.
Keystone Box Co., Pittsburgh, Pa.
Kieckhefer Container Co., Camden, N. J.
Kress, F. J. Box Co., Pittsburgh, Pa.
Maryland Container Co., Inc., Baltimore, Md.
Merchant Suppliers Paper Co., New York, N. Y.
National Container Corp., Long Island City, N. Y.
National Metal Edge Box Co., Phila., Pa.
National Paper Box Co., Kansas City, Mo.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
New England Box Co., Greenfield, Mass.
New England Container Co., Chicopee, Mass.
Ohio Boxboard Co., The, Rittman, Ohio
Old Dominion Box Co., Inc., Charlotte, N. C.
Ottawa River Paper Co., The, Toledo, Ohio
Owens-Illinois Glass Co., Toledo, Ohio
Owens-Illinois Pacific Coast Co., San Francisco, Calif.
Pollock Paper & Box Co., Dallas, Texas
Rosner Container Co., New York, N. Y.
St. Regis Paper Co., New York, N. Y.
Schulz, A. Geo. Co., Milwaukee, Wis.
Spear Box Co., Inc., New York, N. Y.
Superior Paper Products Co., Pittsburgh, Pa.
Texas Paper Box Mfg. Co., Dallas, Texas
Transcontinental Container Corp., Corona, L. I., N. Y.
U. S. Corrugated Fibre Box Co., Indianapolis, Ind.
Waldorf Paper Products Co., St. Paul, Minn.
Western Paper Box Co., Detroit, Mich.

BOXES, CORRUGATED & SOLID FIBRE WITH WOODEN FRAMES

Anderson Box & Basket Co., Inc., New York, N. Y.
Andrews, O. B. Co., Chattanooga, Tenn.
Ashtabula Corrugated Box Co., The, Ashtabula, Ohio
Copeland Displays, Inc., New York, N. Y.
Eddy Paper Corp., The, Chicago, Ill.
Hummel & Downing Co., Milwaukee, Wis.
Kieckhefer Container Co., Camden, N. J.
New England Box Co., The, Greenfield, Mass.
Ohio Boxboard Co., The, Rittman, Ohio
Ross Paper Box Co., New York, N. Y.
Schutz Bros., New York, N. Y.
Waldorf Paper Products Co., St. Paul, Minn.

BOXES, FANCY WOOD

Anderson Box & Basket Co., Inc., New York, N. Y.
Andrews, O. B. Co., Chattanooga, Tenn.
Autokraft Box Corp., Hanover, Pa.
Birmingham Paper Co., Birmingham, Ala.
Copeland Displays, Inc., New York, N. Y.
Electric City Box Co., Buffalo, N. Y.
Eureka Mfg. Co., Inc., Taunton, Mass.
Harlich Mfg. Co., Mastercraft Div., Chicago, Ill.
Leominster Paper Box Co., Leominster, Mass.
New England Box Co., The, Greenfield, Mass.
Nicoll & Co., San Francisco, Calif.
Nussbaum Novelty Co., Berne, Ind.
Peterson Bros., Chicago, Ill.
Pilliod Cabinet Co., The, Swanton, Ohio
Rock Mfg. Co., Stoughton, Mass.
Schutz Bros., New York, N. Y.
Seaman Box Co., Inc., New York, N. Y.
Stiles, H. A. & Co., Boston, Mass.
Warner Bros. Co., The, Bridgeport, Conn.

BOXES, FOLDING

(See Cartons, Folding & Display)

BOXES, LEATHERETTE

Acme Paper Box Co., Chicago, Ill.
Apex Paper Box Corp., Chicago, Ill.
Arrow Mfg. Co., Inc., Hoboken, N. J.
Atlantic Paper Box Co., Boston, Mass.
Beggs & Graham, Phila., Pa.
Cambridge Paper Box Co., Cambridge, Mass.
Chaspec Mfg. Co., New York, N. Y.
Consolidated Box Co., Inc., Tampa, Fla.
Deisroth, W. H. Co., Inc., Phila., Pa.
Ehlbert Products, Chicago, Ill.
Electric City Box Co., Buffalo, N. Y.
Eureka Mfg. Co., Inc., Taunton, Mass.
Farrington Mfg. Co., Boston, Mass.
Fibre Products Mfg. Co., New York, N. Y.
Fleisig, H. Inc., New York, N. Y.
Freedman Die Cutters Inc., New York, N. Y.
Globe Paper Box Co., Chicago, Ill.
Globe Paper Box Mfg. Co., St. Paul, Minn.
Harlich Mfg. Co., Mastercraft Div., Chicago, Ill.
Howell, F. M. & Co., Elmira, N. Y.
Jones, Jesse Paper Box Co., Phila., Pa.
Leominster Paper Box Co., Leominster, Mass.
Lindley Box & Paper Co., Marion, Ind.
Livingston & Co., Inc., New York, N. Y.
Lorscheider-Schang Co., Inc., The, Rochester, N. Y.
Mason Box Co., The, Attleboro Falls, Mass.
Mutual Paper Box Corp., Chicago, Ill.
National Metal Edge Box Co., Phila., Pa.
National Paper Box Co., Kansas City, Mo.
Neumann, Robert Co., The, Cincinnati, Ohio
Pictorial Paper Package Corp., Aurora, Ill.
Pollock Paper & Box Co., Dallas, Texas
Ritchie, W. C. & Co., Chicago, Ill.
Schmidt, Henry & Bro., Inc., Phila., Pa.
Schulz, A. Geo Co., Milwaukee, Wis.
Seaman Box Co., Inc., New York, N. Y.
Shearer-Neumann Co., Cincinnati, Ohio
Smith, S. K. Co., The, Chicago, Ill.
Star Case Co., The, New York, N. Y.
Trilsch, Oscar Co., Whitestone, N. Y.
Universal Jewelry Case Co., Chicopee, Mass.
Warner Bros. Co., The, Bridgeport, Conn.
Weinman Bros., Chicago, Ill.

BOXES, MAILING

Acme Folding Box Co., Inc., New York, N. Y.
Acme Paper Box Co., Chicago, Ill.
American Package Co., New York, N. Y.
Barger Box Co., Inc., Elkhart, Ind.
Berles Carton Co., Inc., Paterson, N. J.
Buffinton, F. H. Co., Providence, R. I.
Burnett, R. L. Co., San Antonio, Texas
Calumet Carton Co., Harvey, Ill.
Cambridge Paper Box Co., Cambridge, Mass.
Campbell Box & Tag Co., South Bend, Ind.
Casco Paper Box Co., Inc., Portland, Maine.
Central Carton Co., The, Cincinnati, Ohio
Cin-Made Corp., The, Cincinnati, Ohio
Clover Box & Mfg. Co., Inc., New York, N. Y.
Columbus Paper Box Co., Inc., Columbus, Ohio
Consolidated Box Co., Inc., Tampa, Fla.
Crook Paper Box Co., Kansas City, Mo.
Cross Paper Products Corp., New York, N. Y.
Cowles, Harold A. Box & Display Co., Rochester, N. Y.
Danbury Square Box Co., Danbury, Conn.
Deisroth, W. H. Co., Inc., Phila., Pa.
Delman Paper Box Co., The, Cincinnati, Ohio
Disbrow Mfg. Co., Inc., The, Newark, N. J.
Electric City Box Co., Buffalo, N. Y.
Estes, E. B. & Sons, Inc., New York, N. Y.
Fitzhugh, Wm. W. Inc., New York, N. Y.
Flashfold Box Corp., Ft. Wayne, Ind.

Fleishhacker Paper Box Co., San Francisco, Calif.
Fleisig, H. Inc., New York, N. Y.
Fox, C. J. Co., The, Providence, R. I.
Frankenberg Bros., Inc., Columbus, Ohio
Freedman Die Cutters Inc., New York, N. Y.
Friend Box Co., Danvers, Mass.
Gardner-Richardson Co., The, Middletown, Ohio
Gates Paper Co., Ltd., The, Los Angeles, Calif.
Gereke-Allen Carton Co., St. Louis, Mo.
Globe Paper Box Co., Chicago, Ill.
Greenfield Paper Box Co., Greenfield, Mass.
Henry, Ira L. Co., Watertown, Wis.
Hinde & Dauch Paper Co., Sandusky, Ohio
Hope Paper Box Co., Providence, R. I.
Howell, F. M. & Co., Elmira, N. Y.
Indianapolis Paper Container Co., Indianapolis, Ind.
International Mailing Tube & Wrapper Co., Long Island City, N. Y.
Kalamazoo Paper Box Co., Kalamazoo, Mich.
Keystone Box Co., Pittsburgh, Pa.
Kiernan-Hughes Co., Jersey City, N. J.
Koehl, Wm. Co., The, Cincinnati, Ohio
Lengsfield Bros., Inc., New Orleans, La.
Lindley Box & Paper Co., Marion, Ind.
Livingston & Co., Inc., New York, N. Y.
Mankato Paper Box Co., Mankato, Minn.
Mason Box Co., The, Attleboro Falls, Mass.
Miller, Walter P. Co., Inc., Phila., Pa.
Mooney & Mooney, Inc., Newark, N. J.
Morris Paper Mills, Chicago, Ill.
Mutual Paper Box Corp., Chicago, Ill.
Myers, J. & P. B. Inc., Jersey City, N. J.
National Folding Box Co., New Haven, Conn.
National Metal Edge Box Co., Phila., Pa.
National Paper Box Co., Kansas City, Mo.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
Neumann, Robert Co., The, Cincinnati, Ohio
Nolan Paper Box Co., Los Angeles, Calif.
Old Dominion Box Co., Inc., Charlotte, N. C.
Paper Package Co., Indianapolis, Ind.
Pharmacy Paper Box Co., Chicago, Ill.
Pictorial Paper Package Corp., Aurora, Ill.
Pohlig Bros., Richmond, Va.
Pollock Paper & Box Co., Dallas, Texas
Ritchie, W. C. & Co., Chicago, Ill.
Rudnic, A. & A. Inc., New York, N. Y.
Schmidt, Henry & Bro., Inc., Phila., Pa.
Schoettle, Edwin J. Co., Phila., Pa.
Schulz, A. Geo. Co., Milwaukee, Wis.
Schutz Bros., New York, N. Y.
Sears, Merle Paper Box Co., Danville, Ill.
Shampain, Citron, Clark, Inc., Bklyn, N. Y.
Shearer-Neumann Co., Cincinnati, Ohio
Shuttleworth Carton Co., Inc., New York, N. Y.
Stein, A. & Co., Chicago, Ill.
Spear Box Co., Inc., New York, N. Y.
Superior Folding Box Co., St. Louis, Mo.
Thoma Paper Box Co., Inc., Buffalo, N. Y.
Universal Folding Box Co., Inc., Hoboken, N. J.
Universal Jewelry Case Co., Chicopee, Mass.
Warner Brothers Co., The, Bridgeport, Conn.
Wilkata Folding Box Co., The, Kearney, N. J.
Wilkins Paper Box Co., Inc., Boston, Mass.
Wilson Paper Box Co., Inc., Richmond, Va.
Wolverine Carton Co., Grand Rapids, Mich.
Young, Douglas Inc., Pawtucket, R. I.
Young, Everett Co., Providence, R. I.

BOXES, METAL, COVERED

(Fabric, Leatherette, Etc.)

Arrow Mfg. Co., Inc., Hoboken, N. J.
Electric City Box Co., Buffalo, N. Y.
Farrington Mfg. Co., Boston, Mass.
Harlich Mfg. Co., Mastercraft Div., Chicago, Ill.
Hudson, H. L. Co., The, Bklyn, N. Y.
Mutual Paper Box Corp., Chicago, Ill.
National Paper Box Co., Kansas City, Mo.
Reynolds Metals Co., Richmond, Va.
Smith, S. K. Co., The, Chicago, Ill.

BOXES, METAL EDGE

Acme Folding Box Co., Inc., New York, N. Y.
Aluminum Container Corp., Fulton, N. Y.
Fleishhacker Paper Box Co., San Francisco, Calif.
Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
National Metal Edge Box Co., Phila., Pa.
Reynolds Metals Co., Richmond, Va.
Seaman Box Co., Inc., New York, N. Y.
Warner Bros. Co., The, Bridgeport, Conn.

BOXES, METAL SPECIALTIES

(For Mascara, Cosmetics, Compacts, Etc.)

Advertising Metal Display Co., Chicago, Ill.
Aluminum Container Corp., Fulton, N. Y.
American Aluminum Ware Co., Newark, N. J.
Beggs & Graham, Phila., Pa.
Bridgeport Metal Goods Mfg. Co., Bridgeport, Conn.
Burdick & Son Inc., Albany, N. Y.
Ellis, George D. & Sons, Inc., Phila., Pa.
Farrington Mfg. Co., Boston, Mass.
Grammes, L. F. & Sons, Inc., Allentown, Pa.
Gutmann, Ferdinand & Co., Bklyn, N. Y.
Harlich Mfg. Co., Mastercraft Div., Chicago, Ill.
Hudson, H. L. Co., The, Bklyn, N. Y.
Majestic Metal Specialties, Inc., New York, N. Y.
Reynolds Metals Co., Richmond, Va.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Products Co., The, Seymour Conn.
Sterling Seal Co., Erie, Pa.

BOXES, PAPER SET-UP

Acme Paper Box Co., Chicago, Ill.
Alder, H. M. & Co., Baltimore, Md.
Alderman Paper Box Corp., Rochester, N. Y.
American Package Co., New York, N. Y.
American Tri-State Paper Box Co., Nashville, Tenn.
Angelus Paper Box Corp., Los Angeles, Calif.
Apex Paper Box Corp., Chicago, Ill.
Atlanta Box Factory, Inc., Atlanta, Ga.
Atlantic Carton Corp., Norwich, Conn.
Atlantic Paper Box Co., Boston, Mass.
Atlantic Paper Box Corp., The, Jersey City, N. J.
Atlas Boxmakers, Inc., Chicago, Ill.
Atlas Paper Box Co., Chattanooga, Tenn.
Automatic Box Co., New York, N. Y.
Babcock Box Co., Attleboro, Mass.
Baldwin, Eli & Son, Inc., New York, N. Y.
Bangor Box Co., Bangor, Maine
Barger Box Co., Inc., Elkhart, Ind.
Beggs & Graham, Phila., Pa.
Bicknell & Fuller Paper Box Co., Boston, Mass.
Bierdeman Paper Box Co., The, Chicago, Ill.
Bird & Son, Inc., E. Walpole, Mass.
Birmingham Paper Co., Birmingham, Ala.
Bisler, G. A. Inc., Phila., Pa.
Bloomer Bros. Co., Newark, New York State
Bradley & Gilbert Co., The, Louisville, Ky.
Brick & Ballerstein, New York, N. Y.
Bridgeport Paper Box Co., Bridgeport, Conn.
Brown & Bailey Co., Phila., Pa.
Buedingen, Ferdinand Co., Inc., Rochester N. Y.
Buffington, F. H. Co., Providence, R. I.
Burnett, R. L. Co., San Antonio, Texas
Burt, F. N. Co., Inc., Buffalo, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Capitol Paper Box Co., Inc., N. Bergen, N. J.
Carter, Wm. Co., Needham Heights, Mass.
Casco Paper Box Co., Inc., Portland, Maine
Casselman, T. & E. Inc., New York, N. Y.
Central Paper Box Co., Kansas City, Mo.
Central States Paper & Bag Co., St. Louis, Mo.
Claff, M. B. & Sons, Inc., Randolph, Mass.
Clark, B. Co., The, Danbury, Conn.
Clogston Paper Box Co.,New Haven, Conn.
Clover Box & Manufacturing Co., Inc., New York, N. Y.
Columbia Paper Box Co., Washington, D. C.
Columbus Paper Box Co., Inc., Columbus, Ohio
Compressed Paper Box Corp., Bridgeport, Conn.
Consolidated Box Co., Inc., Tampa, Fla.
Consolidated Paper Box Co., Somerville, Mass.
Container Corp. of America, Chicago, Ill.
Cowles, Harold A. Box & Display Co., Rochester, N. Y.
Crompton-Adelphia, John Corp., Phila., Pa.
Crook Paper Box Co., N. Kansas City, Mo.
Danbury Square Box Co., Danbury, Conn.
Datz Mfg. Co., Phila., Pa.
Deisroth, W. H. Co., Inc., Phila., Pa.
Delman Paper Box Co., The, Cincinnati, Ohio
Delta Paper Boxes, Inc., New York, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Dickerman Box Co., Cambridge, Mass.
Dix, J. J. Inc., New York, N. Y.
Dodge Paper Box Co., Leominster, Mass.
Dorfman, A. Co., Inc., New York, N. Y.
Driggs Paper Products Corp., Bklyn, N. Y.
Eagle Paper Box Co., Detroit, Mich.
Eagle Paper Box Co., New York, N. Y.
Eagle Paper Box Mfg. Co., Chicago, Ill.
Earlville Paper Box Co., Earlville, N. Y.
Eggerss O'Flying Co., Omaha, Nebr.
Ellis, Geo. D. & Sons, Inc., Phila., Pa.
Electric City Box Co., Buffalo, N. Y.
Eureka Paper Box Corp., Chicago, Ill.
Fairchild, E. E. Corp., Rochester, N. Y.
Fibreboard Products, Inc., San Francisco, Calif.
Fleishhacker Paper Box Co., San Francisco, Calif.
Fleisig, H. Inc., New York, N. Y.
Flour City Paper Box Co., Minneapolis, Minn.
Flower City Specialty Co., Rochester, N. Y.
Foster & Cross, Bklyn, N. Y.
Frankenberg Bros., Inc., Columbus, Ohio
Friend Box Co., Danvers, Mass.
Futuristic Paper Box Co., Inc., Bklyn, N. Y.
Garfield Box Co., Clifton, N. J.
Gebereux, Dufft & Kinder, New York, N. Y.
Globe Paper Box Co., Chicago, Ill.
Globe Paper Box Mfg. Co., St. Paul, Minn.
Gordon Cartons, Inc., Baltimore, Md.
Grace, Tom W. Co., Dallas, Texas
Grand Rapids Paper Box Co., Grand Rapids, Mich.
Great Lakes Box Co., The, Cleveland, Ohio
Green Bros., Inc., E. Providence, R. I.
Greenfield Paper Box Co., Greenfield, Mass.
Hampshire Paper Box Co., Florence, Mass.
Hashagen Paper Box Co., Washington, D. C.
Heminway Corp., Waterbury, Conn.
Henry, Ira L. Co., Watertown, Wis.
Heppe-Hudson Co., Jersey City, N. J.
Hess & Densen, New York, N. Y.
Heywood Mfg. Co., Minneapolis, Minn.
Hickory Paper Box Co., Hickory, N. C.
High Point Paper Box Co., Inc., High Point, N. C.
Hoague-Sprague Corp., Lynn, Mass.
Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
Hope Paper Box Co., Providence, R. I.
Howell, F. M. & Co., Elmira, N. Y.
Illinois Paper Box Co., Chicago, Ill.
Imperial Paper Box Co., Bklyn, N. Y.

Addresses of companies listed appear on pages 1022–1033

XUM

Indianapolis Paper Container Corp., Indianapolis, Ind.
Inman Mfg. Co., Inc., Amsterdam, N. Y.
Jones, Jesse Paper Box Co., Phila., Pa.
Kalamazoo Paper Box Co., Kalamazoo, Mich.
Kentucky Paper Box Co., Louisville, Ky.
Keystone Box Co., Pittsburgh, Pa.
Kiernan-Hughes Co., Jersey City, N. J.
Klein, A. & Co., Inc., New York, N. Y.
Koehl, Wm. Co., The, Cincinnati, Ohio
Kroeck Paper Box Co., Chicago, Ill.
L-A Paper Box Factory, Los Angeles, Calif.
Lebanon Paper Box Co., Lebanon, Pa.
Leeds Sales Co., Inc., New York, N. Y.
Lengsfield Bros., Inc., New Orleans, La.
Leominster Paper Box Co., Leominster, Mass.
Livingston & Co., Inc., New York, N. Y.
Lorscheider-Schang Co., Rochester, N. Y.
Maderite Paper Box Co., Winsted, Conn.
Makdon Co., New York, N. Y.
Makowsky, J. Corp., New York, N. Y.
Mankato Paper Box Co., Mankato, Minn.
Maryland Paper Box Co., Baltimore, Md.
Mason Box Co., The, Attleboro Falls, Mass.
Master Craftsmen of the Set-Up Paper Box Industry, Phila., Pa.
McClintock Corp., The, Harrisburg, Pa.
Meyer, Frank C. Co., Inc., Bklyn, N. Y.
Miller, Walter P. Co., Inc., Phila., Pa.
Minkoff & Rosenfield Bros., Inc., Bklyn, N. Y.
Miro Container Co., Inc., Bklyn, N. Y.
Modern Boxes, Inc., Chicago, Ill.
Molitor Box Co., Milwaukee, Wis.
Mooney & Mooney, Inc., Newark, N. J.
Moser Paper Box Co., St. Louis, Mo.
Mutual Paper Box Corp., Chicago, Ill.
National Metal Edge Box Co., Phila., Pa.
National Paper Box Co., Kansas City, Mo.
Neumann, Robert Co., Cincinnati, Ohio
Newark Paper Box Co., Newark, N. J.
Newton Carton, Newark, N. J.
Nolan Paper Box Co., Los Angeles, Calif.
North State Paper Box Co., Statesville, N. C.
Old Dominion Box Co., Inc., Charlotte, N. C.
Paper Box & Specialty Co., Sheboygan, Wis.
Paper Package Co., Indianapolis, Ind.
Perfumers & Jewelers Box Co., New York, N. Y.
Pharmacy Paper Box Co., Chicago, Ill.
Pictorial Paper Package Corp., Aurora, Ill.
Plumly, Eugene K. Co., Phila., Pa.
Plumly, Geo. W. Co., Inc., Phila., Pa.
Pohlig Bros., Richmond, Va.
Pollock Paper & Box Co., Dallas, Texas
Quality Park Box Co., St. Paul, Minn.
Quartin Specialty Box Co., Bklyn, N. Y.
Quincy Paper Box Co., Quincy, Ill.
Ritchie, W. C. & Co., Chicago, Ill.
Rock City Paper Box Co., Nashville, Tenn.
Rogers, Edward H. Inc., New York, N. Y.
Rowell, E. N. Co., Inc., Batavia, N. Y.
Rubin, Jos. & Sons, Inc., Bklyn, N. Y.
Rudnick, A. & A. Inc., New York, N. Y.
Scandore Paper Box Co., Bklyn, N. Y.
Schleicher, F. J. Paper Box Co., St. Louis, Mo.
Schmeer's Paper Box Co., Inc., Syracuse, N. Y.
Schmidt, Henry & Bro., Inc., Phila., Pa.
Schoettle, Edwin J. Co., Phila., Pa.
Schulz, A. Geo. Co., Milwaukee, Wis.
Schurmann, F. A. Inc., Bklyn, N. Y.
Scott & McDonald, Inc., Everett, Mass.
Seaman Box Co., Inc., New York, N. Y.
Sears, Merle Paper Box Co., Danville, Ill.
Seeley Tube & Box Co., Newark, N. J.
Service Paper Box Co., St. Louis, Mo.
Shampain, Citron, Clark, Inc., Bklyn, N. Y.
Shaw Paper Box Co., Pawtucket, R. I.
Shaw-Randall Co., Pawtucket, R. I.
Shawprint, Inc., Lowell, Mass.
Shearer-Neumann Co., Cincinnati, Ohio
Shomer-Majestic Box Corp., New York, N. Y.
Shoup-Owens, Inc., Hoboken, N. J.
Simplex Paper Box Corp., Lancaster, Pa.
Slichter Box Co., Inc., Mohnton, Pa.
Smith-Lustig Paper Box Mfg. Co., The, Cleveland, Ohio
Snyder, Geo. H. Inc., Phila., Pa.
Specialty Paper Box Co., Bklyn, N. Y.
Sprowles & Allen Inc., Phila., Pa.
Stein, A. & Co., Chicago, Ill.
Sterling-Wasser Box Co., Homestead, Pa.
Sterrett, D. B. Co., Bklyn, N. Y.
Strouse Adler Co., New Haven, Conn.
Taylor Box Co., Providence, R. I.
Terre Paper Box Co., Chicago, Ill.
Texas Paper Box Mfg. Co., Dallas, Texas
Thoma Paper Box Co., Inc., Buffalo, N. Y.
Trilsch, Oscar Co., Whitestone, N. Y.
Trum, E. J. Inc., Bklyn, N. Y.
Union Paper Box Mfg. Co., Seattle, Wash.
United Paper Box Corp., Chicago, Ill.
Universal-Engel Paper Box Mfg. Co., Inc., St. Louis, Mo.
Universal Jewelry Case Co., Chicopee, Mass.
Utica Box Co., Inc., Utica, N. Y.
Van Ness Bros., Inc., Paterson, N. J.
Voss, Karl Corp., Hoboken, N. J.
Wallace Paper Box Corp., New York, N. Y.
Warneke Paper Box Co., Denver, Colo.
Warner Bros. Co., The, Bridgeport, Conn.
Western Paper Box Co., Detroit, Mich.
Whitney & Co., Leominster, Mass.
Wilkins Paper Box Co., Inc., Boston, Mass.
Wilson Paper Box Co., Inc., Richmond, Va.
Wolfsheim & Sachs Co., New York, N. Y.
Young, Douglas Inc., Pawtucket, R. I.
Young, Everett Co., Providence, R. I.
Youse, C. J. Co., The, Baltimore, Md.
Zumbiel, C. W. Co., The, Norwood, Ohio

BOXES, RIGID TRANSPARENT

(See Containers, Rigid Transparent)

BOXES, TIN LITHOGRAPHED

Aluminum Container Corp., Fulton, N. Y.
American Can Co., New York, N. Y.
Bertels Metal Ware Co., Kingston, Pa.
Buckeye Stamping Co., The, Columbus, Ohio
Burdick & Son, Albany, N. Y.
Cans, Inc., Chicago, Ill.
Clark, Geo. V. Co., Inc., Astoria, L. I., N. Y.
Clark, J. L. Mfg. Co., Rockford, Ill.
Columbia Specialty Co., Inc., Baltimore, Md.
Continental Can Co., New York, N. Y.
Crown Can Co., Phila., Pa.
Ellis, Geo. D. & Sons, Inc., Phila., Pa.
Empire Can Co., Bklyn, N. Y.
Federal Tin Co., Inc., Baltimore, Md.
Fein's Tin Can Co., Inc., Bklyn, N. Y.
Gutmann, Ferdinand & Co., Bklyn, N. Y.
Heekin Can Co., Cincinnati, Ohio
Hudson, H. L. Co., The, New York, N. Y.
Independent Can Co., Baltimore, Md.
Liberty Can & Sign Co., Lancaster, Pa.
Litho Can Corp., Camden, N. J.
Mason Can Co., E. Providence, R. I.
Melind, Louis Co., Chicago, Ill.
National Can Corp., New York, N. Y.
Pacific Can Co., San Francisco, Calif.
Robertson Can Co., Springfield, Ohio
Seymour Products Co., The, Seymour, Conn.
Sterling Seal Co., Erie, Pa.
Western Can Co., San Francisco, Calif.

BOXES, WOOD, COVERED

(Fabric, Leatherette, Etc.)

Arrow Mfg. Co., Inc., Hoboken, N. J.
Beggs & Graham, Phila., Pa.
Cambridge Paper Box Co., Cambridge, Mass.
Electric City Box Co., Buffalo, N. Y.
Eureka Mfg. Co., Inc., Taunton, Mass.
Globe Paper Box Co., Chicago, Ill.
Leominster Paper Box Co., Leominster, Mass.
Mele Mfg. Co., Inc., New York, N. Y.
New England Box Co., The, Greenfield, Mass.
Shoup-Owens, Inc., Hoboken, N. J.
Smith, S. K. Co., The, Chicago, Ill.
Universal Jewelry Case Co., Chicopee, Mass.
Warner Bros. Co., The, Bridgeport, Conn.

BOXES & BASKETS, FRUIT & VEGETABLE

Anderson Box & Basket Co., Inc., New York, N. Y.
Andrews, O. B. Co., Chattanooga, Tenn.
Ashtabula Corrugated Box Co., The, Ashtabula, Ohio
Container Corp. of America, Chicago, Ill.
Fibreboard Products, Inc., San Francisco, Calif.
Fort Wayne Corrugated Paper Co., Fort Wayne, Ind.
Gaylord Container Corp., St. Louis, Mo.
Gordon Cartons, Inc., Baltimore, Md.
Hinde & Dauch Paper Co., The, Sandusky, Ohio
Inland Container Corp., Indianapolis, Ind.
Inman Mfg. Co., Inc., Amsterdam, N. Y.
Kress, F. J. Box Co., Pittsburgh, Pa.
National Metal Edge Box Co., Phila., Pa.
Ohio Boxboard Co., The, Rittman, Ohio
Richardson Taylor Globe Corp., Cincinnati, Ohio
Schoettle, Edwin J. Co., Phila., Pa.
Schutz Bros., New York, N. Y.
Seaman Box Co., Inc., New York, N. Y.
Standard Paper Box Corp., Los Angeles, Calif.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
U. S. Corrugated Fiber Box Co., Indianapolis, Ind.
Verhalen, Walter Co., Hope, Ark.
Waldorf Paper Products Co., St. Paul, Minn.
Warner Bros. Co., The, Bridgeport, Conn.

CADDIES, CRACKERS

American Can Co., New York, N. Y.
Andrews, O. B. Co., Chattanooga, Tenn.
Chicago Carton Co., Chicago, Ill.
Consolidated Paper Co., Monroe, Mich.
Crescent Box Corp., Phila., Pa.
Crook Paper Box Co., Kansas City, Mo.
Densen-Banner Co., Ridgefield Park, N. J.
Fibreboard Products, Inc., San Francisco, Calif.
Gair, Robert Co., Inc., New York, N. Y.
Gardner-Richardson Co., The, Middletown, Ohio
Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
Hummel & Downing Co., Milwaukee, Wis.
Interstate Folding Box Co., Middletown, Ohio
Lengsfield Bros., Inc., New Orleans, La.
Mason Can Co., E. Providence, R. I.
Morris Paper Mills, Chicago, Ill.
National Can Corp., New York, N. Y.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
Pohlig Bros., Richmond, Va.
Pollock Paper & Box Co., Dallas, Texas
Schoettle, Edwin J. Co., Phila., Pa.
Schulz, A. Geo. Co., Milwaukee, Wis.
Texas Paper Box Mfg. Co., Dallas, Texas
Transparent Specialties Corp., Cleveland, Ohio
Union Paper Box Mfg. Co., Seattle, Wash.
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Warner Bros. Co., The, Bridgeport, Conn.
Wolverine Carton Co., Grand Rapids, Mich.

CANS, FIBRE

American Can Co., New York, N. Y.
Beacon Container Co., New York, N. Y.
Burt, F. N. Co., Inc., Buffalo, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Canister Co., The, Phillipsburg, N. J.
Central Paper Box Co., Kansas City, Mo.
Cin-Made Corp., The, Cincinnati, Ohio
Clark, Geo. V. Co., Inc., Astoria, L. I., N. Y.
Cleveland Container Co., The, Cleveland, Ohio
Consolidated Box Co., Inc., Tampa, Fla.
Continental Can Co., Inc., New York, N. Y.
Cross Paper Products Corp., New York, N. Y.
Diamond Straw & Machine Co., New York, N. Y.
Eggerss O'Flying Co., Omaha, Nebr.
Fibreboard Products, Inc., San Francisco, Calif.
Fibro Container Corp., Minneapolis, Minn.
Gates Paper Co., Ltd., Los Angeles, Calif.
Heminway Corp., Waterbury, Conn.
Indianapolis Paper Container Corp., Indianapolis, Ind.
Jolly Gulp, Inc., Chicago, Ill.
Loroco Industries, Inc., Reading, Ohio
Marathon Corp., Menasha, Wis.
Miro Container Co., Inc., Bklyn, N. Y.
National Paper Box Co., Kansas City, Mo.
Niemand Bros., Inc., Long Island City, N. Y.
Old Dominion Box Co., Inc., Charlotte, N. C.
Pictorial Paper Package Corp., Aurora, Ill.
Platt Corp., Baltimore, Md.
R. C. Can Co., St. Louis, Mo.
Reynolds Metals Co., Richmond, Va.
Ritchie, W. C. & Co., Chicago, Ill.
Sealright Co., Inc., Fulton, N. Y.
Sefton Fibre Can Co., St. Louis, Mo.
Shoup-Owens, Inc., Hoboken, N. J.
Sonoco Products Co., Hartsville, S. C.
Sutherland Paper Co., Kalamazoo, Mich.
Waldorf Paper Products Co., St. Paul, Minn.
Young, Everett Co., Providence, R. I.

CANS, FIBRE, IMPREGNATED

American Can Co., New York, N. Y.
Beacon Container Co., New York, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Canister Co., Inc., The, Phillipsburg, N. J.
Clark, Geo. V. Co., Inc., Astoria, L. I., N. Y.
Cleveland Container Co., The, Cleveland, Ohio
Continental Can Co., Inc., New York, N. Y.
Diamond Straw & Machine Co., New York, N. Y.
Fibreboard Products, Inc., San Francisco, Calif.
Fibro Container Corp., Minneapolis, Minn.
Gates Paper Co., Ltd., Los Angeles, Calif.
Leominster Paper Box Co., Leominster, Mass.
Loroco Industries, Inc., Reading, Ohio
Niemand Bros., Inc., Long Island City, N. Y.
Reynolds Metals Co., Richmond, Va.
Sefton Fibre Can Co., St. Louis, Mo.
Shoup-Owens, Inc., Hoboken, N. J.
Sutherland Paper Co., Kalamazoo, Mich.

CANS, METAL

Aluminum Container Corp., Fulton, N. Y.
American Can Co., New York, N. Y.
Armstrong Paint & Varnish Works, Chicago, Ill.
Arwood Can Co., Knoxville, Tenn.
Bedford Can Co., Bklyn, N. Y.
Belleville Can Co., Belleville, N. J.
Bertels Metal Ware Co., Inc., Kingston, Pa.
Buckeye Stamping Co., The, Columbus, Ohio
Burdick & Son, Albany, N. Y.
Bushwick Can Co., Inc., Bklyn, N. Y.
Cadillac Can Co., Mt. Clemens, Mich.
Cans, Inc., Chicago, Ill.
Central Can Co., Chicago, Ill.
Central Can Co., Inc., Kansas City, Mo.
Chesapeake Can Co., Inc., Crisfield, Md.
Clark, Geo. V. Co., Inc., Astoria, L. I., N. Y.
Clark, J. L. Mfg. Co., Rockford, Ill.
Clarke Can Co., Phila., Pa.
Columbia Specialty Co., Inc., Baltimore, Md.
Conneaut Can Co., The, Conneaut, Ohio
Continental Can Co., Inc., New York, N. Y.
Cordiano Can Co., Inc., Bklyn, N. Y.
Crown Can Co., Phila., Pa.
Davies Can Co., The, Cleveland, Ohio
Eagle Can Co., Somerville, Mass.
Eastern Can Co., Inc., Bklyn, N. Y.
Ellis, Geo. D. & Sons, Inc., Phila., Pa.
Empire Can Corp., Bklyn, N. Y.
Federal Tin Co., Inc., Baltimore, Md.
Fein's Tin Can Co., Inc., Bklyn, N. Y.
General Can Co., Chicago, Ill.
Grand Sheet Metal Works, Chicago, Ill.
Grimely, Frank J., San Francisco, Calif.
Heekin Can Co., The, Cincinnati, Ohio
Hudson, H. L. Co., Bklyn, N. Y.
Independent Can Co., Baltimore, Md.
Inland Steel Container Co., Chicago, Ill.
LeComte & Co., Inc., Bklyn, N. Y.
Liberty Can & Sign Co., Lancaster, Pa.
Lincoln Can Mfg. Corp., Bklyn, N. Y.
Litho Can Corp., Camden, N. J.
Manufacturers Can Co., Chicago, Ill.
Mason Can Co., E. Providence, R. I.
Melvina Can Co., Maspeth, L. I., N. Y.
Milton, Geo. A. Can Co., Inc., Bklyn, N. Y.
National Can Corp., New York, N. Y.
National Tin Can Manufactory Co., New York, N. Y.
New Can Co., Inc., The, Malden, Mass.
Olive Can Co., Chicago, Ill.
Pacific Can Co., San Francisco, Calif.
Phelps Can Co., Baltimore, Md.
Philadelphia Can Co., Phila., Pa.
Platt Corp., Baltimore, Md.
Robertson Can Co., Springfield, Ohio
Sexton Can Co., Inc., Everett, Mass.
Standard Can Co., Chicago, Ill.
Steel & Tin Prods. Co., Inc., Baltimore, Md.
Sterling Seal Co., Erie, Pa.
Stuber & Kuck Co., Peoria, Ill.
Superior Can Co., Inc., Bklyn, N. Y.
Thompson Can Co., Dallas, Texas
Vulcan Stamping & Mfg. Co., Inc., Bellwood, Ill.
Western Can Co., San Francisco, Calif.
Wheeling Corrugating Co., Wheeling, W. Va.

CANS, METAL

(Cellulose Window)

American Aluminum Ware Co., Newark, N. J.
Conneaut Can Co., The, Conneaut, Ohio
National Transparent Plastics Co., Springfield, Mass.
Robertson Can Co., Springfield, Ohio
Seaman Box Co., Inc., New York, N. Y.
Spear Box Co., New York, N. Y.
Vulcan Stamping & Mfg. Co., Bellwood, Ill.

CANS, PAPER

(For Bulk Ice Cream)

Beacon Container Co., New York, N. Y.
Fibreboard Products, Inc., San Francisco, Calif.
Lengsfield Bros., Inc., New Orleans, La.
Marathon Corp., The, Menasha, Wis.
Morris Paper Mills, Chicago, Ill.
National Folding Box Co., New Haven, Conn.
Sealright Co., Inc., Fulton, N. Y.

CANS, RIGID TRANSPARENT

Atlantic Paper Box Co., Boston, Mass.
Automatic Box Co., New York, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Celanese Plastics Corp., New York, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Cin-Made Corp., The, Cincinnati, Ohio
Clark, Geo. V. Co., Inc., Astoria, L. I., N. Y.
Clover Box & Mfg. Co., Inc., New York, N. Y.
Design Center, Inc., Flushing, L. I., N. Y.
Diamond Straw & Machine Co., New York, N. Y.
Fleishhacker Paper Box Co., San Francisco, Calif.
Henry, Ira L. Co., Watertown, Wis.
Levy, Maurice, New York, N. Y.
Loroco Industries, Inc., Reading, Ohio
Makdon Co., New York, N. Y.
Miller, Walter P. Co., Inc., Phila., Pa.
Miro Container Co., Inc., Bklyn, N. Y.
National Transparent Plastics Co., Springfield, Mass.
Neostyle, Inc., Chicago, Ill.
Plastic Art Craft, New York, N. Y.
Ritchie, W. C. & Co., Chicago, Ill.
Seaman Box Co., Inc., New York, N. Y.
Shaw Paper Box Co., Pawtucket, R. I.
Shaw-Randall Co., Pawtucket, R. I.
Transparent Specialties Corp., Cleveland, Ohio
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Weinman Bros., Chicago, Ill.

CARTONS, CANS & BOTTLE CARRIERS

Acme Folding Box Co., St. Louis, Mo.
Albert Paper Box Co., Inc., Bklyn, N. Y.
Alford Cartons, Ridgefield Park, N. J.
American Coating Mills, Inc., Elkhart, Ind.
Andrews, O. B. Co., Chattanooga, Tenn.
Atlanta Paper Box Co., Atlanta, Ga.
Atlantic Carton Corp., Norwich, Conn.
Badger Carton Co., Milwaukee, Wis.
Berles Carton Co., Inc., Paterson, N. J.
Burt, F. N. Co., Inc., Buffalo, N. Y.
Calumet Carton Co., Harvey, Ill.
Chicago Carton Co., Chicago, Ill.
Container Corp. of America, Chicago, Ill.
Continental Folding Paper Box Co., Inc., Ridgefield, N. J.
Continental Paper Products Co., Denver, Colo.
Crescent Box Corp., Phila., Pa.
Empire Box Corp., Garfield, N. J.
Federal Carton Corp., New York, N. Y.
Fibreboard Products, Inc., San Francisco, Calif.
Fitzhugh, Wm. W. Inc., New York, N. Y.
Fort Orange Paper Co., Castleton-on-Hudson, N. Y.
Fort Wayne Corrugated Paper Co., Fort Wayne, Ind.
Gair, Robert Co., Inc., New York, N. Y.
Gardner-Richardson Co., The, Middletown, Ohio
Gaylord Container Corp., St. Louis, Mo.
Gebhart Folding Box Co., The, Dayton, Ohio
Grand Rapids Paper Box Co., Grand Rapids, Mich.
Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
International Folding Paper Box Co., Inc., N. Bergen, N. J.
Interstate Folding Box Co., The, Middletown, Ohio
Koehl, Wm. Co., The, Cincinnati, Ohio
Lengsfield Bros., Inc., New Orleans, La.
Loroco Industries, Inc., Reading, Ohio
Lowman Folding Box Corp., Syracuse, N. Y.
Modern Packages, Inc., Memphis, Tenn.
Morris Paper Mills, Chicago, Ill.
National Metal Edge Box Co., Phila., Pa.

Addresses of companies listed appear on pages 1022–1033

XUM

Nelson, B. F. Mfg. Co., Minneapolis, Minn.
New Haven Pulp & Board Co., New Haven, Conn.
Ohio Boxboard Co., The, Rittman, Ohio
Old Dominion Box Co., Inc., Charlotte, N. C.
Paper Package Co., Indianapolis, Ind.
Pohlig Bros., Richmond, Va.
Pollock Paper & Box Co., Dallas, Texas
Reynolds Metals Co., Richmond, Va.
Robertson Paper Box Co., Inc., Montville, Conn.
Sale Lithograph Co., Buffalo, N. Y.
Sample-Durick Co., Inc., Chicopee, Mass.
Schmidt Lithograph Co., San Francisco, Calif.
Schoettle, Edwin J. Co., Phila., Pa.
Shellmar Products Corp., Mt. Vernon, Ohio
Shuttleworth Carton Co., New York, N. Y.
Standard Paper Box Co., Detroit, Mich.
Standard Paper Box Corp., Los Angeles, Calif.
Sutherland Paper Co., Kalamazoo, Mich.
United Paperboard Co., New York, N. Y.
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Warner Bros. Co., The, Bridgeport, Conn.
Wilkata Folding Box Co., The, Kearny, N. J.
Wolverine Carton Co., Grand Rapids, Mich.

CARTONS, FOLDING & DISPLAY

(Folding Boxes)

Ace Carton Corp., Chicago, Ill.
Acme Folding Box Co., St. Louis, Mo.
Acme Folding Box Co., Inc., New York, N. Y.
Acme Paper Box Co., Chicago, Ill.
Addison Lithographing Co., Rochester, N. Y.
Albert Paper Box Co., Inc., Bklyn, N. Y.
Alderman Paper Box Corp., Rochester, N. Y.
Alford Cartons, Ridgefield Park, N. J.
American Box Board Co., Chicago, Ill.
American Coating Mills, Inc., Elkhart, Ind.
American Folding Box Co., St. Louis, Mo.
American Package Co., New York, N. Y.
American Tri-State Paper Box Co., Nashville, Tenn.
Andrews, O. B. Co., Chattanooga, Tenn.
Andrews, P. L. Corp., Bklyn, N. Y.
Angelus Paper Box Co., Los Angeles, Calif.
Atlanta Paper Co., Atlanta, Ga.
Atlantic Carton Corp., Norwich, Conn.
Atlas Boxmakers, Inc., Chicago, Ill.
Automatic Box Co., New York, N. Y.
Automatic Paper Box Corp., Chicago, Ill.
Badger Merchandising Displays, Inc., Milwaukee, Wis.
Barger Box Co., Inc., Elkhart, Ind.
Berles Carton Co., Inc., Paterson, N. J.
Bicknell & Fuller Paper Box Co., Boston, Mass.
Birmingham Paper Co., Birmingham, Ala.
Bloomer Bros. Co., Newark, New York State
Blum Folding Paper Box Co., Inc., Bklyn, N. Y.
Bradley & Gilbert Co., The, Louisville, Ky.
Bridgeport Paper Box Co., Bridgeport, Conn.
Brooks & Porter, Inc., New York, N. Y.
Brooks Bank Note Co., Springfield, Mass.
Brown & Bailey Co., Phila., Pa.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Burd & Fletcher Co., Kansas City, Mo.
Burnett, R. L. Co., San Antonio, Texas
Burt, F. N. Co., Inc., Buffalo, N. Y.
Calumet Carton Co., Harvey, Ill.
Campbell Box & Tag Co., South Bend, Ind.
Carton Service, Inc., Shelby, Ohio
Central Carton Co., Cincinnati, Ohio
Central Paper Box Co., Kansas City, Mo.
Chicago Carton Co., Chicago, Ill.
Chicago Label & Box Co., Chicago, Ill.
Columbia Paper Box Co., Washington, D. C.
Columbus Paper Box Co., Inc., Columbus, Ohio
Consolidated Box Co., Inc., Tampa, Fla.
Consolidated Paper Co., Monroe, Mich.
Consolidated Paper & Box Mfg. Co., Richmond, Va.
Container Corp. of America, Chicago, Ill.
Continental Folding Paper Box Co., Inc., Ridgefield, N. J.
Continental Paper Prods. Co., Denver, Colo.
Cowles, Harold A. Box & Display Co., Rochester, N. Y.
Crescent Box Corp., Phila., Pa.
Curtis, S. & Son, Inc., Sandy Hook, Conn.
Delman Paper Box Co., The, Chicago, Ill.
Densen-Banner Co., Ridgefield Park, N. J.
Diamond Paper Box Co., Rochester, N. Y.
Disbrow Mfg. Co. Inc., The, Newark, N. J.
Dowd, M. S. Carton Co., Hartford Conn.
Eastern Display Corp., New York, N. Y.
Eggerss O'Flying Co., Omaha, Nebr.
Empire Box Corp., Chicago, Ill.
Empire Box Corp., Garfield, N. J.
Eureka Paper Box Co., Williamsport, Pa.
Fairchild, E. E. Corp., Rochester, N. Y.
Federal Carton Corp., New York, N. Y.
Ferguson-Lander Mfg. Co., Chicago, Ill.
Fibreboard Products, Inc., San Francisco, Calif.
Fitzhugh, Wm. W. Inc., New York, N. Y.
Fleishhacker Paper Box Co., San Francisco, Calif.
Fleming & Sons, Inc., Dallas, Texas
Flour City Paper Box Co., Minneapolis, Minn.
Folding Boxes, Inc., Manchester, Conn.
Forbes Lithograph Mfg. Co., Boston, Mass.
Fort Orange Paper Co., Castleton-on-Hudson, N. Y.
Fox, C. J. Co., The, Providence, R. I.
Frankenberg Bros., Inc., Columbus, Ohio
Franklin Folding Paper Box Co., Chicago, Ill.
Franklyn Folding Box Co., Bklyn, N. Y.
Gair, Robert Co., Inc., New York, N. Y.
Gardner-Richardson Co., The, Middletown, Ohio
Gaylord Container Corp., St. Louis, Mo.
Gebhart Folding Box Co., The, Dayton, Ohio
Gereke-Allen Carton Co., St. Louis, Mo.
Globe Paper Box Co., Chicago, Ill.
Globe Paper Box Mfg. Co., St. Paul, Minn.
Gordon Cartons, Inc., Baltimore, Md.
Grace, Tom W. Co., Dallas, Texas
Grand-City Container Corp., New York, N. Y.
Grand Rapids Paper Box Co., Grand Rapids, Mich.
Grant Paper Box Co., Pittsburgh, Pa.
Great Lakes Box Co., Cleveland, Ohio
Guilford Folding Box Co., The, Baltimore, Md.
Hashagen Paper Box Co., Washington, D. C.
High Point Paper Box Co., Inc., High Point, N. C.
Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
Howell, F. M. & Co., Elmira, N. Y.
Hummel & Downing Co., Milwaukee, Wis.
Ideal Carton Co., Chicago, Ill.
Imperial Box Co., Chicago, Ill.
Indianapolis Paper Container Corp., Indianapolis, Ind.
Industrial Packaging Co., Bklyn, N. Y.
Inland Lithograph Co., Chicago, Ill.
International Folding Paper Box Co., N. Bergen, N. J.
Interstate Folding Box Co., The, Middletown, Ohio
Koehl, Wm. Co., The, Cincinnati, Ohio
Lebanon Paper Box Co., Lebanon, Pa.
Lengsfield Bros., Inc., New Orleans, La.
Lindley Box & Paper Co., Marion, Ind.
Lord Baltimore Press, The, Baltimore, Md.
Lowman Folding Box Corp., Syracuse, N. Y.
Makdon Co., New York, N. Y.
Mankato Paper Box Co., Mankato, Minn.
Maryland Paper Box Co., Baltimore, Md.
Michigan Carton Co., Battle Creek, Mich.
Milprint Inc., Miwaukee, Wis.
Modern Packages, Inc., Memphis, Tenn.
Morris Paper Mills, Chicago, Ill.
Mott Carton & Paper Co., St. Louis, Mo.
Muskegon Paper Box Co., Muskegon, Mich.
Myers, J. & P. B. Inc., Jersey City, N. J.
National Folding Box Co., New Haven, Conn.
National Metal Edge Box Co., Phila., Pa.
National Paper Box Co., Kansas City, Mo.
National Paper Box Mfg. Co., Chicago, Ill.
National Paper Co., Atlanta, Ga.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
Neumann, Robert Co., Cincinnati, Ohio
Nevins-Church Press, The, New York, N. Y.
New England Collapsible Tube Co., Chicago, Ill.
New Haven Pulp & Board Co., New Haven, Conn.
Ohio Boxboard Co., The, Rittman, Ohio
Old Dominion Box Co., Inc., Charlotte, N. C.
Paper Box & Specialty Co., Sheboygan, Wis.
Paper Package Co., Indianapolis, Ind.
Pictorial Paper Package Corp., Aurora, Ill.
Pie-Pak Co., Inc., Hoboken, N. J.
Pioneer Paper Box Co., Minneapolis, Minn.
Pohlig Bros., Richmond, Va.
Pollock Paper & Box Co., Dallas, Texas
Randolph Box & Label Co., Chicago, Ill.
Reynolds Metals Co., Richmond, Va.
Richardson Taylor Globe Corp., Cincinnati, Ohio
Robertson Paper Box Co., Inc., Montville, Conn.
Rochester Folding Box Co., Rochester, N. Y.
Rock City Paper Box Co., Nashville, Tenn.
Rossotti Lithographing Co., Inc., N. Bergen N. J.
Royal Paper Box Co., Los Angeles, Calif.
Rudnick, A. & A. Inc., New York, N. Y.
Sale Lithograph Co., Buffalo, N. Y.
Sample-Durick Co., Inc., Chicopee, Mass.
Scandore Paper Box Co., Inc., Bklyn, N. Y.
Schmidt, Henry & Bro., Inc., Phila., Pa.
Schmidt Lithograph Co., San Francisco, Calif.
Schoettle, Edwin J. Co., Phila., Pa.
Schulz, A. Geo. Co., Milwaukee, Wis.
Seaman Box Co., Inc., New York, N. Y.
Sears, Merle Paper Box Co., Danville, Ill.
Self-Locking Carton Co., Chicago, Ill.
Shellmar Products Corp., Mt. Vernon, Ohio
Shultz Folding Box Co., Inc., St. Louis, Mo.
Shuttleworth Carton Co., New York, N. Y.
Simplex Paper Box Corp., Lancaster, Pa.
Simpson & Doeller Co., The, Baltimore, Md.
Southern Paper Co., Ltd., New Orleans, La.
Spear Box Co., Inc., New York, N. Y.
Standard Paper Box Co., Detroit, Mich.
Standard Paper Box Corp., Los Angeles, Calif.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Superior Folding Box Co., St. Louis, Mo.
Sutherland Paper Co., Kalamazoo, Mich.
Texas Paper Box Mfg. Co., Dallas, Texas
Toledo Paper Box Co., Toledo, Ohio
Trenton Folding Box Co., Trenton, N. J.
Trum, E. J. Inc., Bklyn, N. Y.
Union Paper Box Mfg. Co., Seattle, Wash.
United Paperboard Co., New York, N. Y.
United States Printing & Lithograph Co., The, Cincinnati, Ohio
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Warneke Paper Box Co., Denver, Colo.
Warner Bros. Co., The, Bridgeport, Conn.
Western Paper Box Co., Oakland, Calif.
Western Paper Box Co., Detroit, Mich.
Whitney & Co., Leominster, Mass.
Wilkata Folding Box Co., The, Kearny, N. J.
Wilson Paper Box Co., Inc., Richmond, Va.
Wolverine Carton Co., Grand Rapids, Mich.
Yates Carton Co., Chicago, Ill.
Zipprodt, Inc., Chicago, Ill.
Zumbiel, C. W. Co., Cincinnati, Ohio

Bold-face listings indicate advertisers in this issue

CARTONS, LAMINATED

Ace Carton Corp., Chicago, Ill.
Acme Folding Box Co., Inc., New York, N. Y.
Acme Paper Box Co., Chicago, Ill.
American Box Board Co., Chicago, Ill.
American Coating Mills, Inc., Elkhart, Ind.
Arvey Corp., Chicago, Ill.
Atlantic Carton Corp., Norwich, Conn.
Bemiss Jason Co., San Francisco, Calif.
Berles Carton Co., Inc., Paterson, N. J.
Brooks & Porter, Inc., New York, N. Y.
Bulkley, Dunton & Co., Inc., New York, N. Y.
Calumet Carton Co., Harvey, Ill.
Continental Folding Paper Box Co. Inc., Ridgefield, N. J.
Crescent Box Corp., Phila., Pa.
Empire Box Corp., Garfield, N. J.
Fitzhugh, Wm. W. Inc., New York, N. Y.
Gordon Cartons, Inc., Baltimore, Md.
Grand-City Container Corp., New York, N. Y.
Hummel & Downing Co., Milwaukee, Wis.
Interstate Folding Box Co., The, Middletown, Ohio
Lengsfield Bros., Inc., New Orleans, La.
Michigan Carton Co., Battle Creek, Mich.
Modern Packages, Inc., Memphis, Tenn.
National Transparent Plastics Co., Springfield, Mass.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
Ohio Boxboard Co., The, Rittman, Ohio
Pollock Paper & Box Co., Dallas, Texas
Reynolds Metals Co., Richmond, Va.
Sale Lithograph Co., Buffalo, N. Y.
Shellmar Products Corp., Mt. Vernon, Ohio
Shuttleworth Carton Co., New York, N. Y.
Sutherland Paper Co., Kalamazoo, Mich.
Trenton Folding Box Co., Trenton, N. J.
United Paperboard Co., New York, N. Y.
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Warner Bros. Co., The, Bridgeport, Conn.
Western Waxed Paper Co., Los Angeles, Calif.

CARTONS, WAXED & PARAFFINED

American Box Board Co., Grand Rapids, Mich.
American Coating Mills, Inc., Elkhart, Ind.
American Package Co., New York, N. Y.
Andrews, O. B. Co., Chattanooga, Tenn.
Atlanta Paper Co., Atlanta, Ga.
Atlantic Carton Corp., Norwich, Conn.
Bemiss Jason Co., San Francisco, Calif.
Berles Carton Co., Inc., Paterson, N. J.
Birmingham Paper Co., Birmingham, Ala.
Bloomer Bros. Co., Newark, New York State
Bradley & Gilbert Co., The, Louisville, Ky.
Brooks Bank Note Co., Springfield, Mass.
Brooks & Porter, Inc., New York, N. Y.
Brown & Bailey Co., Phila, Pa.
Chicago Carton Co., Chicago, Ill.
Columbus Paper Box Co., Inc., Columbus, Ohio
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Chicago, Ill.
Continental Paper Products Co., Denver, Colo.
Crescent Box Corp., Phila., Pa.
Densen-Banner Co., Ridgefield Park, N. J.
Diamond Paper Box Co., Inc., Rochester, N. Y.
Empire Box Corp., Garfield, N. J.
Federal Carton Corp., New York, N. Y.
Ferguson-Lander Mfg. Co., Chicago, Ill.
Fibreboard Products, Inc., San Francisco, Calif.
Fitzhugh, Wm. W. Inc., New York, N. Y.
Fleishhacker Paper Box Co., San Francisco, Calif.
Fort Orange Paper Co., Castleton-on-Hudson, N. Y.
Fox, C. J. Co., The, Providence, R. I.
Frankenberg Bros., Inc., Columbus, Ohio
Gair, Robert Co., Inc., New York, N. Y.
Gardner-Richardson Co., The, Middletown, Ohio
Gates Paper Co., Ltd., The, Los Angeles, Calif.
Gaylord Container Corp., St. Louis, Mo.
Gebhart Folding Box Co., The, Dayton, Ohio
Globe Paper Box Mfg. Co., St. Paul, Minn.
Gordon Cartons, Inc., Baltimore, Md.
Grant Paper Box Co., Pittsburgh, Pa.
High Point Paper Box Co., Inc., High Point, N. C.
Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
Interstate Folding Box Co., The, Middletown, Ohio
Lengsfield Bros., Inc., New Orleans, La.
Lindley Box & Paper Co., Marion, Ind.
Lowman Folding Box Corp., Syracuse, N. Y.
Marathon Corp., Menasha, Wis.
Michigan Carton Co., Battle Creek, Mich.
Modern Packages, Inc., Memphis, Tenn.
National Metal Edge Box Co., Phila., Pa.
National Paper Box Co., Kansas City, Mo.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
New Haven Pulp & Board Co., New Haven, Conn.
Ohio Boxboard Co., The, Rittman, Ohio
Paper Package Co., Indianapolis, Ind.
Pohlig Bros., Richmond, Va.
Pollock Paper & Box Co., Dallas, Texas
Richardson Taylor Globe Corp., Cincinnati, Ohio
Robertson Paper Box Co., Montville, Conn.
Schmidt Lithograph Co., San Francisco, Calif.
Schoettle, Edwin J. Co., Phila., Pa.
Schulz, A. Geo. Co., Milwaukee, Wis.
Shuttleworth Carton Co., Inc., New York, N. Y.
Standard Paper Box Corp., Los Angeles, Calif.
Sutherland Paper Co., Kalamazoo, Mich.
Toledo Paper Box Co., The, Toledo, Ohio
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Warner Bros. Co., The, Bridgeport, Conn.
Western Waxed Paper Co., Los Angeles, Calif.
Wilkata Folding Box Co., The, Kearny, N. J.
Wolverine Carton Co., Grand Rapids, Mich.
Zumbiel, C. W. Co., Cincinnati, Ohio

CHESTS

(See Boxes, Fancy Wood)
(See Boxes, Leatherette)
(See Boxes, Wood, Covered)

COMPACTS, PAPER

Loroco Industries, Inc., Reading, Ohio

CONTAINERS, CERAMIC, CLAY, POTTERY

(See Pottery Containers)

CONTAINERS, DEHYDRATED FOODS

(Bulk)

Andrews, O. B. Co., Chattanooga, Tenn.
Atlas-Boxmakers, Inc., Chicago, Ill.
Beacon Container Co., New York, N. Y.
Canister Co., Inc., The, Phillipsburg, N. J.
Carpenter Container Corp., Bklyn, N. Y.
Container Co., The, Van Wert, Ohio
Container Corp. of America, Chicago, Ill.
Continental Can Co., New York, N. Y.
Dewey & Almy Chemical Co., Cambridge, Mass.
Fibreboard Products, Inc., San Francisco, Calif.
Fibro Container Corp., Minneapolis, Minn.
Gardner-Richardson Co., The, Middletown, Ohio
Inland Container Corp., Indianapolis, Ind.
Interstate Folding Box Co., The, Middletown, Ohio
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Kieckhefer Container Co., Camden, N. J.
Lengsfield Bros., Inc., New Orleans, La.
Loroco Industries, Inc., Reading, Ohio
Marathon Corp., Menasha, Wis.
Master Package Corp., The, Owen, Wis.
Miro Container Co., Inc., Bklyn, N. Y.
New England Box Co., The, Greenfield, Mass.
Pacific Can Co., San Francisco, Calif.
Reynolds Metals Co., Richmond, Va.
Shellmar Products Corp., Mount Vernon, Ohio
Sutherland Paper Co., Kalamazoo, Mich.
Twitchell, E. W. Inc., Pkg. Div., Phila., Pa.
U. S. Corrugated Fiber Box Co., Indianapolis, Ind.
Waldorf Paper Products Co., St. Paul, Minn.
Western Waxed Paper Co., Los Angeles, Calif.

CONTAINERS, DEHYDRATED FOODS

(Unit)

Andrews, O. B. Co., Chattanooga, Tenn.
Berles Carton Co., Inc., Paterson, N. J.
Canister Co., Inc., The, Phillipsburg, N. J.
Chicago Carton Co., Chicago, Ill.
Consolidated Box Co., Inc., Tampa, Fla.
Container Corp. of America, Chicago, Ill.
Continental Folding Paper Box Co., Inc., Ridgefield, N. J.
Continental Paper Products Co., Denver, Colo.
Dewey & Almy Chemical Co., Cambridge, Mass.
Fibreboard Products, Inc., San Francisco, Calif.
Fleishhacker Paper Box Co., San Francisco, Calif.
Frankenberg Bros., Inc., Columbus, Ohio
Gardner-Richardson Co., The, Middletown, Ohio
Gates Paper Co., Ltd., Los Angeles, Calif.
Hi-Land Paper Products Co., Ossining, N. Y.
Interstate Folding Box Co., The, Middletown, Ohio
Leeds Sales Co., Inc., New York, N. Y.
Lengsfield Bros., Inc., New Orleans, La.
Loroco Industries, Inc., Reading, Ohio
Marathon Corp., Menasha, Wis.
Miro Container Co., Inc., Bklyn, N. Y.
Mott Carton & Paper Co., St. Louis, Mo.
National Metal Edge Box Co., Phila., Pa.
New England Box Co., The, Greenfield, Mass.
Oneida Paper Products, Inc., New York, N. Y.
Reynolds Metals Co., Richmond, Va.
Ritchie, W. C. & Co., Chicago, Ill.
Royal, Thomas M. & Co., Phila., Pa.
Schmidt Lithograph Co., San Francisco, Calif.
Shellmar Products Corp., Mt. Vernon, Ohio
Shuttleworth Carton Co., New York, N. Y.
Standard Paper Box Corp., Los Angeles, Calif.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
U.S. Printing & Lithograph Co., The, Cincinnati, Ohio
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Western Waxed Paper Co., Los Angeles, Calif.

CONTAINERS, FLEXIBLE

(See also Bags, Envelopes)

Bemis Bro. Bag Co., St. Louis, Mo.
Cadillac Products, Inc., Detroit, Mich.
Cincinnati Industries, Inc., Cincinnati, Ohio
Clarvan Corp., Milwaukee, Wis.
Diaphane Bag Corp. of Pa., Phila., Pa.

Addresses of companies listed appear on pages 1022–1033

Hi-Land Paper Products Co., Ossining, N. Y.
Kehr Paper Products Co., Phila., Pa.
Kennedy Car Liner & Bag Co., Shelbyville, Ind.
Neostyle Inc., Chicago, Ill.
Protective Coatings Corp., Belleville, N. J.
Reynolds Metals Co., Richmond, Va.
Royal, Thomas M. & Co., Phila., Pa.
Schorsch & Co., Inc., New York, N. Y.
Shellmar Products Corp., Mt. Vernon, Ohio
Sun Tube Corp., Hillside, N. J.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Western Waxed Paper Co., Los Angeles, Calif.

CONTAINERS, FROZEN FOODS
(Bulk)

Andrews, O. B. Co., Chattanooga, Tenn.
Atlanta Paper Co., Atlanta, Ga.
Beacon Container Co., New York, N. Y.
Betner, Benj. C. Co., Devon, Pa.
Carpenter Container Corp., Bklyn, N. Y.
Container Co., The, Div. Continental Can Co., Inc., Van Wert, Ohio
Crescent Box Corp., Phila., Pa.
Fibreboard Products, Inc., San Francisco, Calif.
Gardner-Richardson Co., The, Middletown, Ohio
Genesee Valley Lithograph Co., Inc., Rochester, N. Y.
Hinde & Dauch Paper Co., The, Sandusky, Ohio
Inland Container Corp., Indianapolis, Ind.
Interstate Folding Box Co., The, Middletown, Ohio
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Kieckhefer Container Co., Camden, N. J.
Kress, F. J. Box Co., Pittsburgh, Pa.
Lengsfield Bros., Inc., New Orleans, La.
Loroco Industries, Inc., Reading, Ohio
Marathon Corp., Menasha, Wis.
Master Package Corp., The, Owen, Wis.
Milprint, Inc., Milwaukee, Wis.
Moist-R-Proof Container Co., San Francisco, Calif.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
New England Box Co., The, Greenfield, Mass.
Protective Coatings Corp., Belleville, N. J.
Reynolds Metals Co., Richmond, Va.
Sealright Co., Inc., Fulton, N. Y.
Sutherland Paper Co., Kalamazoo, Mich.
Thompson Can Co., Dallas, Texas
Union Paper Box Mfg. Co., Seattle, Wash.
U. S. Corrugated Fiber Box Co., Indianapolis, Ind.
Waldorf Paper Products Co., St. Paul, Minn.
Western Waxed Paper Co., Los Angeles, Calif.

CONTAINERS, FROZEN FOODS
(Unit)

American Can Co., New York, N. Y.
Andrews, O. B. Co., Chattanooga, Tenn.
Atlantic Carton Corp., Norwich, Conn.
Berles Carton Co., Inc., Paterson, N. J.
Betner, Benj. C. Co., Devon, Pa.
Birmingham Paper Co., Birmingham, Ala.
Bloomer Bros. Co., Newark, New York State
Chicago Carton Co., Chicago, Ill.
Consolidated Box Co., Inc., Tampa, Fla.
Container Corp. of America, Chicago, Ill.
Continental Can Co., Inc., New York, N. Y.
Continental Folding Paper Box Co., Inc., Ridgefield, N. J.
Continental Paper Products Co., Denver, Colo.
Crescent Box Corp., Phila., Pa.
Dewey & Almy Chemical Co., Cambridge, Mass.
Dixie Cup Co., Easton, Pa.
Fibreboard Products, Inc., San Francisco, Calif.
Fleishhacker Paper Box Co., San Francisco, Calif.
Frankenberg Bros., Inc., Columbus, Ohio
Gardner-Richardson Co., The, Middletown, Ohio
Gates Paper Co., Ltd., Los Angeles, Calif.
Genesee Valley Lithograph Co., Inc., Rochester, N. Y.
Gordon Cartons, Inc., Baltimore, Md.
Harvey Paper Products, Sturgis, Mich.
Hi-Land Paper Products Co., Ossining, N. Y.
Holes, Floyd A. Co., Bedford, Mass.
Industrial Packaging Co., Bklyn, N. Y.
Interstate Folding Box Co., The, Middletown, Ohio
Lengsfield Bros., Inc., New Orleans, La.
Lily-Tulip Cup Corp., New York, N. Y.
Loroco Industries, Inc., Reading, Ohio
Lowman Folding Box Corp., Syracuse, N. Y.
Marathon Corp., Menasha, Wis.
Milprint, Inc., Milwaukee, Wis.
Miro Container Co., Inc., Bklyn, N. Y.
Moist-R-Proof Container Co., San Francisco, Calif.
Mono Containers Div., Continental Can Co., Newark, N. J.
Munson Bag Co., The, Cleveland, Ohio
National Metal Edge Box Co., Phila., Pa.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
Neostyle, Inc., Chicago, Ill.
New England Box Co., The, Greenfield, Mass.
New Haven Pulp & Board Co., New Haven, Conn.
Pollock Paper & Box Co., Dallas, Texas
Reynolds Metals Co., Richmond, Va.
Royal, Thomas M. & Co., Phila., Pa.
Sealright Co., Inc., Fulton, N. Y.
Sefton Fibre Can Co., St. Louis, Mo.
Shellmar Products Corp., Mt. Vernon, Ohio
Standard Paper Box Corp., Los Angeles, Calif.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Sutherland Paper Co., Kalamazoo, Mich.
Thompson Can Co., Dallas, Texas
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Western Waxed Paper Co., Los Angeles, Calif.

CONTAINERS, MOLDED PULP

Chaspec Mfg. Co., New York, N. Y.
Heminway Corp., Waterbury, Conn.
Holed-Tite Packing Corp., Herkimer, N. Y.
Keyes Fibre Co., Waterville, Maine
Pulp Reproduction Co., Milwaukee, Wis.
Self-Locking Carton Co., Chicago, Ill.
Shellmar Products Corp., Mt. Vernon, Ohio
Stevens & Thompson Paper Co., Greenwich, N. Y.

CONTAINERS, PAPER
(Liquid-Holding)

American Can Co., New York, N. Y.
American Lace Paper Co., Milwaukee, Wis.
Beacon Container Co., New York, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Canister Co., Inc., The, Phillipsburg, N. J.
Continental Can Co., Inc., New York, N. Y.
Cupples-Hesse Corp., St. Louis, Mo.
Dixie Cup Co., Easton, Pa.
Fibreboard Products, Inc., San Francisco, Calif.
Gardner-Richardson Co., The, Middletown, Ohio
Harvey Paper Products, Sturgis, Mich.
Interstate Folding Box Co., The, Middletown, Ohio
Lily-Tulip Cup Corp., New York, N. Y.
Marathon Corp., Menasha, Wis.
Miro Container Co., Inc., Bklyn, N. Y.
Mono Containers Div., Continental Can Co., Newark, N. J.
Paper Container Mfg. Co., Chicago, Ill.
Schoettle, Edwin J. Co., Phila., Pa.
Sealright Co., Inc., Fulton, N. Y.
Stecher-Traung Litho. Corp., Rochester, N. Y.
Sutherland Paper Co., Kalamazoo, Mich.
Waldorf Paper Products Co., St. Paul, Minn.

CONTAINERS, PAPER
(Milk)

American Can Co., New York, N. Y.
American Paper Bottle Co., Toledo, Ohio
American Sealcone Corp., New York, N. Y.
Brown & Bailey Co., Phila., Pa.
Continental Folding Paper Box Co., Inc., Ridgefield, N. J.
Ex-Cell-O Corp., Detroit, Mich.
Fibreboard Products, Inc., San Francisco, Calif.
Gardner-Richardson Co., The, Middletown, Ohio
Sealright Co., Inc., Fulton, N. Y.
Single Service Containers, Inc., New York, N. Y.

CONTAINERS, PAPER
(Nesting)

American Paper Goods Co., The, Kensington, Conn.
Bloomer Bros. Co., Newark, New York State
Burt, F. N. Co., Inc., Buffalo, N. Y.
Container Corp. of America, Chicago, Ill.
Cupples-Hesse Corp., St. Louis, Mo.
Densen-Banner Co., Ridgefield Park, N. J.
Dixie Cup Co., Easton, Pa.
Ferguson-Lander Mfg. Co., Chicago, Ill.
Fibreboard Products, Inc., San Francisco, Calif.
Harvey Paper Products, Sturgis, Mich.
High Point Paper Box Co., Inc., High Point, N. C.
Lily-Tulip Cup Corp., New York, N. Y.
Miro Container Co., Inc., Bklyn, N. Y.
Mono Containers Div., Continental Can Co., Newark, N. J.
Rudnick, A. & A. Inc., New York, N. Y.
Schoettle, Edwin J. Co., Phila., Pa.
Schulz, A. Geo. Co., Milwaukee, Wis.
Sealright Co., Inc., Fulton, N. Y.
Seaman Box Co., Inc., New York, N. Y.
Stevens & Thompson Paper Co., Greenwich, N. Y.

CONTAINERS, RIGID TRANSPARENT

Acme Paper Box Co., Chicago, Ill.
Allvue Container Corp., Bklyn, N. Y.
Atlanta Box Factory, Inc., Atlanta, Ga.
Atlantic Paper Box Co., Boston, Mass.
Birmingham Paper Co., Birmingham, Ala.
Blue River Plastics Mfg. Corp., New York, N. Y.
Buckley, C. E. Co., Leominster, Mass.
Buedingen, Ferdinand Co., Inc., Rochester, N. Y.
Burt, F. N. Co., Inc., Buffalo, N. Y.
Celluplastic Corp., Newark, N. J.
Central States Paper & Bag Co., St. Louis, Mo.
Clark, Geo. V. Co., Inc., Astoria, L. I., N. Y.
Clover Box & Mfg. Co., Inc., New York, N. Y.
Crystal Tube Corp., Chicago, Ill.
Design Center, Inc., Flushing, L. I., N. Y.
Emeloid Co., Inc., Arlington, N. J.
Friend Box Co., Danvers, Mass.
Globe Paper Box Co., Chicago, Ill.
Great American Plastics Co., Fitchburg, Mass.
Heminway Corp., Waterbury, Conn.
Henry, Ira L. Co., Watertown, Wis.

Imperial Paper Box Corp., Bklyn, N. Y.
Industrial Packaging Co., Bklyn, N. Y.
Irwin Corp., New York, N. Y.
Loroco Industries, Inc., Reading, Ohio
Makdon Co., New York, N. Y.
Mankato Paper Box Co., Mankato, Minn.
Miller, Walter P. Co., Inc., Phila., Pa.
Miro Container Co., Inc., Bklyn, N. Y.
Modern Boxes, Inc., Chicago, Ill.
National Metal Edge Box Co., Phila., Pa.
National Transparent Plastics Co., Springfield, Mass.
Neostyle, Inc., Chicago, Ill.
Niemand Bros., Inc., Long Island City, N. Y.
Old Dominion Box Co., Inc., Charlotte, N. C.
Parfait Sales Co., Chicago, Ill.
Pedersen, H. Mfg. Co., Los Angeles, Calif.
Ritchie, W. C. & Co., Chicago, Ill.
Seaman Box Co., Inc., New York, N. Y.
Shaw Paper Box Co., Pawtucket, R. I.
Shaw-Randall Co., Pawtucket, R. I.
Sillcocks-Miller Co., The, S. Orange, N. J.
Sterling Injection Molding, Inc., Buffalo, N. Y.
Texas Paper Box Mfg. Co., Dallas, Texas
Tower Envelope Co., New York, N. Y.
Transparent Container Co., Kingston, N. Y.
Transparent Specialties Corp., Cleveland, Ohio
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Waldorf Paper Products Co., St. Paul, Minn.
Wallace Paper Box Corp., New York, N. Y.
Warner Bros. Co., The, Bridgeport, Conn.
Weinman Bros., Chicago, Ill.

CONTAINERS, SHIPPING, WEATHERPROOF CORRUGATED

Ajax Box Co., The, Chicago, Ill.
Fibreboard Products, Inc., San Francisco, Calif.
Fort Wayne Corrugated Paper Co., Fort Wayne, Ind.
Gaylord Container Corp., St. Louis Mo.
Hinde & Dauch Paper Co., The, Sandusky, Ohio
Inland Container Corp., Indianapolis, Ind.
Kieckhefer Container Co., Camden, N. J.
Ohio Boxboard Co., The, Rittman, Ohio
Reynolds Metals Co., Richmond, Va.
U. S. Corrugated Fibre Box Co., Indianapolis, Ind.
Waldorf Paper Products Co., St. Paul, Minn.

CONTAINERS, SHIPPING, WEATHERPROOF FIBRE

Andrews, O. B. Co., Chattanooga, Tenn.
Ashtabula Corrugated Box Co., The, Ashtabula, Ohio
Atlanta Paper Co., Atlanta, Ga.
Atlas-Boxmakers, Inc., Chicago, Ill.
Beacon Container Co., New York, N. Y.
Bird & Son, Inc., E. Walpole, Mass.
Carpenter Container Corp., Bklyn, N. Y.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, Chicago, Ill.
Crook Paper Box Co., N. Kansas City, Mo.
Erie Corrugated Box Co., The, Erie, Pa.
Fibreboard Products, Inc., San Francisco, Calif.
Fibro Container Corp., Minneapolis, Minn.
Gair, Robert Co., Inc., New York, N. Y.
Hinde & Dauch Paper Co., The, Sandusky, Ohio
Hummel & Downing Co., Milwaukee, Wis.
Inland Container Corp., Indianapolis, Ind.
Kieckhefer Container Co., Camden, N. J.
National Container Corp., Long Island City, N. Y.
National Metal Edge Box Co., Phila., Pa.
Ohio Boxboard Co., The, Rittman, Ohio
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Waldorf Paper Products Co., St. Paul, Minn.

CONTAINERS, VENEER

Anderson Box & Basket Co., Inc., New York, N. Y.
Barden & Robeson Corp., Penn Yan, N. Y.
Cummer Graham Co., Paris, Texas
Elberta Crate & Basket Co., Tallahassee, Fla.
Jarrell, B. C. & Co., Humboldt, Tenn.
Leigh Banana Case Co., Ellenton, S. C.
Marvil Package Co., Laurel, Del.
Mid-States Steel & Wire Co., Crawfordsville, Ind.
New England Box Co., The, Greenfield, Mass.
Nocatee-Manatee Crate Co., Manatee, Fla.
Riverside Mfg. Co., Murfreesboro, N. C.
Saint Joe Machines, Inc., St. Joseph, Mich.
Saranac Machine Co., Benton Harbor, Mich.
Southern Package Corp., Hazlehurst, Miss.
Two States Fruit Package Co., Texarkana, Texas
Verhalen, Walter Co., Hope, Ark.

CRATES, WOOD & PLYWOOD

Anderson Box & Basket Co., Inc., New York, N. Y.
New England Box Co., The, Greenfield, Mass.

CUPS

(See also Trays, Crimped & Pressed)

Boston Drinking Cup Co., Dedham, Mass.
Harvey Paper Products, Sturgis, Mich.
Miro Container Co., Inc., Bklyn, N. Y.
Ritchie, W. C. & Co., Chicago, Ill.
Schutz Bros., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.

CUPS, FOOD PACKAGING

American Paper Goods Co., The, Kensington, Conn.
Continental Can Co., Inc., New York, N. Y.
Harvey Paper Products, Sturgis, Mich.
Lily-Tulip Cup Corp., New York, N. Y.
Miro Container Co., Inc., Bklyn, N. Y.
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Sutherland Paper Co., Kalamazoo, Mich.

CUPS, PAPER

(Liquid-Holding)

American Lace Paper Co., Milwaukee, Wis.
American Paper Goods Co., The, Kensington, Conn.
Boston Drinking Cup Co., Dedham, Mass.
Cupples-Hesse Corp., St. Louis, Mo.
Harvey Paper Products, Sturgis, Mich.
Lily-Tulip Cup Corp., New York, N. Y.
Miro Container Co., Inc., Bklyn, N. Y.
Mono Containers Div., Continental Can Co., Newark, N. J.
Sealright Co., Inc., Fulton, N. Y.
Sutherland Paper Co., Kalamazoo, Mich.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.

DISPLAYS, COUNTER

(Merchandise & Dispensing)

Acme Folding Box Co., Inc., New York, N. Y.
Acme Paper Box Co., Chicago, Ill.
Advertising Metal Display Co., Chicago, Ill.
Andrews, O. B. Co., Chattanooga, Tenn.
Animated Display Creators, Minneapolis, Minn.
Arrow Mfg. Co., Inc., Hoboken, N. J.
Arvey Corp., Chicago, Ill.
Autokraft Box Corp., Hanover, Pa.
Badger Merchandising Displays, Inc., Milwaukee, Wis.
Berkowitz, Leon S., Phila., Pa.
Berles Carton Co., Inc., Paterson, N. J.
Brandau-Craig-Dickerson Co., Nashville, Tenn.
Bridgeport Moulded Products, Inc., Bridgeport, Conn.
Bronzart Metals Co., New York, N. Y.
Brooks Bank Note Co., Springfield, Mass.
Brooks & Porter, Inc., New York, N. Y.
Burd & Fletcher Co., Kansas City, Mo.
Burnett, R. L. Co., San Antonio, Texas
Burt, F. N. Co., Inc., Buffalo, N. Y.
Cambriuge Paper Box Co., Cambridge, Mass.
Central States Paper & Bag Co., St. Louis, Mo.
Chaspec Mfg. Co., New York, N. Y.
Chicago Cardboard Co., Chicago, Ill.
Clark, Geo. V. Co., Inc., Astoria, L. I., N. Y.
Clarvan Corp., Milwaukee, Wis.
Clover Box & Mfg. Co., Inc., New York, N. Y.
Consolidated Lithographing Corp., Bklyn, N. Y.
Continental Folding Paper Box Co., Inc., Ridgefield, N. J.
Copeland Displays, Inc., New York, N. Y.
Cowles, Harold A. Box & Display Co., Rochester, N. Y.
Crescent Box Corp., Phila., Pa.
Croasdale & deAngelis, Inc., Upper Darby, Pa.
Design Center, Inc., New York, N. Y.
Display Finishing Co., Inc., Long Island City, N Y.
Display Guild, Elmhurst, Queens, N. Y.
Eastern Display Corp., New York, N. Y.
Farrington Mfg. Co., Boston, Mass.
Fitzhugh, Wm. W., Inc., New York, N. Y.
Forbes Lithograph Mfg. Co., Boston, Mass.
Fox, C. J. Co., The, Providence, R. I.
Freedman Die Cutters, Inc., New York, N. Y.
Friedman Art, New York, N. Y.
Fuller Displays, Inc., Long Island City, N. Y.
Gair, Robert Co., Inc., New York, N. Y.
Gardner-Richardson Co., The, Middletown, Ohio
Glove Paper Box Co., Chicago, Ill.
Grammes, L. F. & Sons, Inc., Allentown, Pa.
Grand-City Container Corp., New York, N. Y.
Gray Wire Specialty Co., Cleveland, Ohio
Gutterson & Co., Inc., New York, N. Y.
Hayden, E. J. & Co., Inc., New York, N. Y.
Helmco, Inc., Chicago, Ill.
Hinde & Dauch Paper Co., Sandusky, Ohio
Imperial Paper Box Co., Bklyn, N. Y.
Independent Lithograph Co., San Francisco, Calif.
Inland Lithograph Co., Chicago, Ill.
Interstate Folding Box Co., Middletown, Ohio
Kay Inc., New York, N. Y.
Kayton, Robert Displays, Inc., New York, N. Y.
Kindred, MacLean & Co., Inc., Long Island City, N. Y.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Lengsfield Bros., Inc., New Orleans, La.
Leominster Paper Box Co., Leominster, Mass.
Livingston & Co., Inc., New York, N. Y.
Lowman Folding Box Corp., Syracuse, N. Y.
Lutz & Sheinkman, New York, N. Y.
Magill-Weinsheimer Co., Chicago, Ill.
Makdon Co., New York, N. Y.
Mandus Co., Inc., New York, N. Y.
Michigan Lithographing Co., Grand Rapids, Mich.
Milprint, Inc., Milwaukee, Wis.
Modern Packages Co., Memphis, Tenn.
Mott Carton & Paper Co., St. Louis, Mo.
Nalco, Inc., New York, N. Y.
National Color Printing Co., Inc., The, Baltimore, Md.
National Folding Box Co., New Haven, Conn.

National Transparent Plastics Co., Springfield, Mass.
New England Box Co., The, Greenfield, Mass.
New Haven Pulp & Board Co., New Haven, Conn.
Nicoll & Co., San Francisco, Calif.
Nussbaum Novelty Co., Berne, Ind.
Oberly & Newell Lithograph Corp., New York, N. Y.
Ohio Boxboard Co., The, Rittman, Ohio
Old Dominion Box Co., Inc., Charlotte, N. C.
Ottawa River Paper Co., The, Toledo, Ohio
Penn Lithographing Co., Phila., Pa.
Philipp Lithographing Co., Milwaukee, Wis.
Rathbun Molding Corp., Salamanca, N. Y.
Regent Specialties, Inc., Rochester, N. Y.
Reynolds Metals Co., Richmond, Va.
Rode & Brand, New York, N. Y.
Roesch, Louis Co., San Francisco, Calif.
Ross Paper Box Co., New York, N. Y.
Sale Lithograph Co., Buffalo, N. Y.
Schmidt, Henry & Bro., Inc., Phila., Pa.
Schmidt Lithograph Co., San Francisco, Calif.
Schutz Bros., New York, N. Y.
Schutz, Thom. A. Co., Chicago, Ill.
Shaw Paper Box Co., Pawtucket, R. I.
Shaw-Randall Co., Pawtucket, R. I.
Shuttleworth Carton Co., New York, N. Y.
Standard Paper Box Corp., Los Angeles, Calif.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Stensgaard, W. L. & Assocs., Chicago, Ill.
Sterling Offset Co., New York, N. Y.
Sutherland Paper Co., Kalamazoo, Mich.
Transparent Specialties Corp., Cleveland, Ohio
Trautmann, Bailey & Blampey, New York, N. Y.
Union Paper Box Mfg. Co., Seattle, Wash.
United Paperboard Co., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
U. S. Printing & Lithograph Co., The, Cincinnati, Ohio
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Warner Bros. Co., The, Bridgeport, Conn.
Weinman Bros., Chicago, Ill.
Wolverine Carton Co., Grand Rapids, Mich.
Zipprodt, Inc., Chicago, Ill.

DISPLAYS, FLOOR STAND

(Corrugated & Solid Fibre)

Ajax Box Co., The, Chicago, Ill.
American Box Board Co., Grand Rapids, Mich.
Arvey Corp., Chicago, Ill.
Badger Merchandising Displays, Inc., Milwaukee, Wis.
Berkowitz, Leon S., Phila., Pa.
Chicago Cardboard Co., Chicago, Ill.
Consolidated Lithographing Corp., Bklyn, N. Y.
Container Corp. of America, Chicago, Ill.
Continental Container Corp., Bklyn, N. Y.
Corro-Lith Corp., Long Island City, N. Y.
Crescent Box Corp., Phila., Pa.
Display Finishing Co., Inc., Long Island City, N. Y.
Display Guild, Elmhurst, Queens, N. Y.
Eddy Paper Corp., The, Chicago, Ill.
Edwards & Deutsch Lithographing Co., Chicago, Ill.
Excelsior Paper Specialties Co., New York, N. Y.
Federal Carton Corp., New York, N. Y.
Fibreboard Products, Inc., San Francisco, Calif.
Forbes Lithograph Mfg. Co., Boston, Mass.
Fuller Displays, Inc., Long Island City, N. Y.
Gair, Robert Co., Inc., New York, N. Y.
Gaylord Container Corp., St. Louis, Mo.
Gereke-Allen Carton Co., St. Louis, Mo.
Grand-City Container Corp., New York, N. Y.
Hankins Container Co., Cleveland, Ohio
Hayden, E. J. & Co., Inc., New York, N. Y.
Helmco, Inc., Chicago, Ill.
Hinde & Dauch Paper Co., The, Sandusky, Ohio
Hummel & Downing Co., Milwaukee, Wis.
Independent Lithograph Co., San Francisco, Calif.
Inland Container Corp., Indianapolis, Ind.
Kay, Inc., New York, N. Y.
Kayton, Robert Displays, Inc., New York, N. Y.
Keystone Box Co., Pittsburgh, Pa.
Kieckhefer Container Co., Camden, N. J.
Kindred, MacLean & Co., Inc., Long Island City, N. Y.
Kress, F. J. Box Co., Pittsburgh, Pa.
Magill-Weinsheimer Co., Chicago, Ill.
Milprint, Inc., Milwaukee, Wis.
National Container Corp., Long Island City, N. Y.
Nelson, B. F. Mfg. Co., Minneapolis, Minn.
Niagara Lithograph Co., Buffalo, N. Y.
Oberly & Newell Lithograph Corp., New York, N. Y.
Ohio Boxboard Co., The, Rittman, Ohio
Ottawa River Paper Co., The, Toledo, Ohio
Philipp Lithographing Co., Milwaukee, Wis.
Process Displays, Inc., Milwaukee, Wis.
Regent Specialties, Inc., Rochester, N. Y.
Reyburn Mfg. Co., Inc., The, Phila., Pa.
Roesch, Louis Co., San Francisco, Calif.
Rode & Brand, New York, N. Y.
Schmidt Lithograph Co., San Francisco, Calif.
Schutz, Thom. A. Co., Chicago, Ill.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
Stensgaard, W. L. & Associates, Inc., Chicago, Ill.
Waldorf Paper Products Co., St. Paul, Minn.
Zipprodt, Inc., Chicago, Ill.

DISPLAYS, METAL, SHEET

Advertising Metal Display Co., Chicago, Ill.
American Can Co., New York, N. Y.
Animated Display Creators, Minneapolis, Minn.
Arvey Corp., Chicago, Ill.
Bronzart Metals Co., New York, N. Y.
Design Center, Inc., New York, N. Y.
Display Guild, Elmhurst, Queens, N. Y.
Farrington Mfg. Co., Boston, Mass.
Grammes, L. F. & Sons, Inc., Allentown, Pa.
Gray Wire Specialty Co., The, Cleveland, Ohio
Heekin Can Co., Cincinnati, Ohio
Helmco, Inc., Chicago, Ill.
Kay, Inc., New York, N. Y.
Kayton, Robert Displays, Inc., New York, N. Y.
Litho Can Corp., Camden, N. J.
Mason Can Co., E. Providence, R. I.
Reynolds Metals Co., Richmond, Va.

DISPLAYS, MOTION

Advertising Metal Display Co., Chicago, Ill.
Animated Display Creators, Minneapolis, Minn.
Badger Merchandising Displays, Inc., Milwaukee, Wis.
Clarvan Corp., Milwaukee, Wis.
Cowles, Harold A. Box & Display Co., Rochester, N. Y.
Design Center, Inc., Flushing, L. I., N. Y.
Display Finishing Co., Inc., Long Island City, N. Y.
Display Guild, Elmhurst, Queens, N. Y.
Displayers, The, New York, N. Y.
Hayden, E. J. & Co., Inc., New York, N. Y.
Magill-Weinsheimer Co., Chicago, Ill.

DISPLAYS, WINDOW & COUNTER

Advertising Metal Display Co., Chicago, Ill.
Animated Display Creators, Minneapolis, Minn.
Arrow Mfg. Co., Inc., Hoboken, N. J.
Arvey Corp., Chicago, Ill.
Badger Merchandising Displays, Inc., Milwaukee, Wis.
Berkowitz, Leon S., Phila., Pa.
Brandau-Craig-Dickerson Co., Nashville, Tenn.
Bridgeport Moulded Products, Inc., Bridgeport, Conn.
Brooks & Porter, Inc., New York, N. Y.
Central Lithograph Co., The, Cleveland, Ohio
Chaspec Mfg. Co., New York, N. Y.
Chicago Cardboard Co., Chicago, Ill.
Clark, Geo. V. Co., Inc., Astoria, L. I., N. Y.
Clarvan Corp., Milwaukee, Wis.
Clover Box & Mfg. Co., Inc., New York, N. Y.
Consolidated Lithographing Corp., Bklyn, N. Y.
Copeland Displays, Inc., New York, N. Y.
Courier Journal Job Printing Co., Louisville, Ky.
Cowles, Harold A. Box & Display Co., Rochester, N. Y.
Croasdale & deAngelis, Inc., Upper Darby, Pa.
Design Center, Inc., New York, N. Y.
Disbrow Mfg. Co., Inc., The, Newark, N. J.
Display Finishing Co., Inc., Long Island City, N. Y.
Display Guild, Elmhurst, Queens, N. Y.
Displayers, The, New York, N. Y.
Electric City Box Co., Buffalo, N. Y.
Empire Lithographing Co., Inc., New York, N. Y.
Farrington Mfg. Co., Boston, Mass.
Ferrill, Harve & Co., Chicago, Ill.
Forbes Lithograph Mfg. Co., Boston, Mass.
Friedman Art, New York, N. Y.
Fuller Displays, Inc., Long Island City, N. Y.
Grammes, L. F. & Sons, Inc., Allentown, Pa.
Hayden, E. J. & Co., Inc., New York, N. Y.
Hussey-Woodward, Inc., New York, N. Y.
Independent Lithograph Co., San Francisco, Calif.
Inland Lithograph Co., Chicago, Ill.
Kay, Inc., New York, N. Y.
Kindred, MacLean & Co., Inc., Long Island City, N. Y.
Kirby-Cogeshall-Steinau Co., Milwaukee, Wis.
Leominster Paper Box Co., Leominster, Mass.
Lowman Folding Box Corp., Syracuse, N. Y.
Lutz & Sheinkman, New York, N. Y.
Magill-Weinsheimer Co., Chicago, Ill.
Makdon Co., New York, N. Y.
Modern Packages Co., Memphis, Tenn.
Nalco, Inc., New York, N. Y.
National Color Printing Co., Inc., Baltimore, Md.
New Haven Pulp & Board Co., New Haven, Conn.
Oberly & Newell Lithograph Corp., New York, N. Y.
Ohio Boxboard Co., The, Rittman, Ohio
Penn Lithographing Co., Phila., Pa.
Philipp Lithographing Co., Milwaukee, Wis.
Process Displays, Inc., Milwaukee, Wis.
Reyburn Mfg. Co., Inc., The, Phila., Pa.
Reynolds Metals Co., Richmond, Va.
Rode & Brand, New York, N. Y.
Roesch, Louis Co., San Francisco, Calif.
Sale Lithograph Co., Buffalo, N. Y.
Shuttleworth Carton Co., New York, N. Y.
Snyder & Black, Inc., New York, N. Y.
Standard Paper Box Corp., Los Angeles, Calif.
Sterling Offset Co., New York, N. Y.
Sutherland Paper Co., Kalamazoo, Mich.
Taylor Box Co., Providence, R. I.
Transparent Specialties Corp., Cleveland, Ohio

Bold-face listings indicate advertisers in this issue

U. S. Printing & Lithograph Co., The, Cincinnati, Ohio
Universal Folding Box Co., Inc., Hoboken, N. J.
Waldorf Paper Products Co., St. Paul, Minn.
Warner Bros., Co., The, Bridgeport, Conn.
Western Lithograph Co., Los Angeles, Calif.
Zipprodt, Inc., Chicago, Ill.

DISPLAYS, WIRE

Clarvan Corp., Milwaukee, Wis.
Display Guild, Elmhurst, Queens, N. Y.
Gray Wire Specialty Co., The, Cleveland, Ohio
Kay, Inc., New York, N. Y.
Stecher-Traung Lithograph Corp., San Francisco, Calif.
Union Steel Products Co., Albion, Mich.
Washburn Co., The, Worcester, Mass.

DRUMS, FIBRE

Atlanta Container Corp., Atlanta, Ga.
Beacon Container Co., New York, N. Y.
Bird & Son, Inc., E. Walpole, Mass.
Canister Co., Inc., The, Phillipsburg, N. J.
Carpenter Container Corp., Bklyn, N. Y.
Cleveland Container Co., The, Cleveland, Ohio
Consolidated Paper Co., Monroe, Mich.
Container Co., The, Div. of Continental Can Co., Inc., Van Wert, Ohio
Container Corp. of America, Chicago, Ill.
Continental Can Co., Inc., New York, N. Y.
Fibreboard Products, Inc., San Francisco, Calif.
Fibro Container Corp., Minneapolis, Minn.
Gardner-Richardson Co., The, Middletown, Ohio
Gates Paper Co., Ltd., Los Angeles, Calif.
Gaylord Container Corp., St. Louis, Mo.
Keystone Drum Co., Pittsburgh, Pa.
Loroco Industries, Inc., Reading, Ohio
Master Package Corp., The, Owen, Wis.
Philadelphia Carpenter Container Co., Phila., Pa.

DRUMS, METAL

Aluminum Co. of America, Pittsburgh, Pa.
American Can Co., New York, N. Y.
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Central Can Co., Inc., Kansas City, Mo.
Continental Can Co., Inc., New York, N. Y.
Crown Can Co., Phila., Pa.
Ellis, George D. & Sons, Inc., Phila., Pa.
Heekin Can Co., Cincinnati, Ohio
Inland Steel Container Co., Chicago, Ill.
J. & L. Steel Barrel Co., Pittsburgh, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
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Vulcan Stamping & Mfg. Co., Bellwood, Ill.
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DRUMS, PLYWOOD

Seymour & Peck Co., Chicago, Ill.
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ENVELOPES, CLOTH & COTTON-LINED PAPER

American Paper Goods Co., The, Kensington, Conn.
Andrews, P. L. Corp., Bklyn, N. Y.
Atlanta Box Factory, Inc., Atlanta, Ga.
Cottonluxe Mfg. Co., New York, N. Y.
Cupples-Hesse Corp., St. Louis, Mo.
Tension Envelope Corp., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Varey-Shea Bag Corp., Elizabeth, N. J.

ENVELOPES, PACKAGING

(Opaque)

American Paper Goods Co., The, Kensington, Conn.
Boston Drinking Cup Co., Dedham, Mass.
Brown Bag Filling Machine Co., The, Fitchburg, Mass.
Cadillac Products, Inc., Detroit, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Genesee Valley Lithograph Co., Inc., Rochester, N. Y.
Herz, Alexander Co., Inc., New York, N. Y.
Hi-Land Paper Products Co., Ossining, N. Y.
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Mason Envelope Co., Inc., New York, N. Y.
National Transparent Plastics Co., Springfield, Mass.
Neostyle Inc., Chicago, Ill.
Penn Lithographing Co., Phila., Pa.
Protective Coatings Corp., Belleville, N. J.
Royal, Thomas M. & Co., Phila., Pa.
Sale Lithograph Co., Buffalo, N. Y.
Stecher-Traung Lithograph Corp., Rochester, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.

ENVELOPES, STRING & BUTTON CLOSURE

American Paper Goods Co., The, Kensington, Conn.
Cupples-Hesse Corp., St. Louis, Mo.
Disbrow Mfg. Co., Inc., Newark, N. J.
Equitable Paper Bag Co., Inc., Long Island City, N. Y.
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Mason Envelope Co., Inc., New York, N. Y.
Talmadge Printing Co., New York, N. Y.
Tension Envelope Corp., Kansas City, Mo.
Tower Envelope Co., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.

ENVELOPES, TRANSPARENT

American Paper Goods Co., The, Kensington, Conn.
Andrews, P. L. Corp., Bklyn, N. Y.
Berkowitz Envelope Co., Kansas City, Mo.
Buckley, C. E. Co., Leominster, Mass.
Cadillac Products, Inc., Detroit, Mich.
Central States Paper & Bag Co., St. Louis, Mo.
Clover Box & Mfg. Co., Inc., New York, N. Y.
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Continental Bag Spec. Corp., New York, N. Y.
Crystal Transparent Mfg. Co., Inc., New York, N. Y.
Crystal Tube Corp., Chicago, Ill.
Cupples-Hesse Corp., St. Louis, Mo.
Diaphane Bag Corp. of Pa., Phila., Pa.
Disbrow Mfg. Co., Inc., The, Newark, N. J.
Dobeckmun Co., The, Cleveland, Ohio
Emeloid Co., Inc., The, Arlington, N. J.
General Felt Products, Div. Standard Cap & Seal Corp., Bklyn, N. Y.
Herz, Alexander Co., Inc., New York, N. Y.
Hi-Land Paper Products Co., Ossining, N. Y.
Humitube Mfg. Co., Peoria, Ill.
Interstate Folding Box Co., Middletown, Ohio
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Leeds Sales Co., Inc., New York, N. Y.
Mason Envelope Co., Inc., New York, N. Y.
Milprint, Inc., Milwaukee, Wis.
Moist-R-Proof Container Co., San Francisco, Calif.
Munson Bag Co., The, Cleveland, Ohio
National Transparent Plastics Co., Springfield, Mass.
Neostyle, Inc., Chicago, Ill.
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Print-A-Tube Co., Passaic, N. J.
Roto-Lith, Ltd., New York, N. Y.
Royal, Thomas M. & Co., Phila., Pa.
Seaman Box Co., New York, N. Y.
Shellmar Products Corp., Mt. Vernon, Ohio
Sillcocks-Miller Co., The, S. Orange, N. J.
Talmadge Printing Co., New York, N. Y.
Tension Envelope Corp., New York, N. Y.
Tower Envelope Co., New York, N. Y.
Transparent Specialties Corp., Cleveland, Ohio
Traver Corp., Chicago, Ill.
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GLASS CONTAINERS

(See Ampuls)
(See Bottles)
(See Jars)

GLASS CONTAINERS, APPLIED COLOR

(See Bottles & Jars, Applied Color)

JARS, GLASS

Anchor Hocking Glass Corp., Lancaster, Ohio
Armstrong Cork Co., Lancaster, Pa.
Ball Brothers Co., Muncie, Ind.
Berman Bros., Inc., Chicago, Ill.
Braun, W. Co., Chicago, Ill.
Brockway Glass Co., Inc., Brockway, Pa.
Carr-Lowrey Glass Co., Baltimore, Md.
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Containers, Inc., Los Angeles, Calif.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Owens-Illinois Glass Co., Toledo, Ohio
Pennsylvania Glass Products Co., Pittsburgh, Pa.
Sager Bros., New York, N. Y.
Swindell Brothers, Baltimore, Md.
Wheaton, T. C. Co., Millville, N. J.

JARS, OPAL

Anchor Hocking Glass Corp., Lancaster, Ohio
Berman Bros., Inc., Chicago, Ill.
Braun, W., Co., Chicago, Ill.
Carr-Lowrey Glass Co., Baltimore, Md.
Glass Container & Cap Outlet Co., New York, N. Y.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Sager Bros., New York, N. Y.
Wheaton, T. C. Co., Millville, N. J.

PACKETS

Andrews, P. L. Co., Bklyn, N. Y.
Berkowitz Envelope Co., Kansas City, Mo.
Bradner Smith & Co., Chicago, Ill.
Brown Bag Filling Machine Co., The, Fitchburg, Mass.
Continental Bag Specialties Corp., New York, N. Y.
Cupples-Hesse Corp., St. Louis, Mo.
Dennison Mfg. Co., Framingham, Mass.
Disbrow Mfg. Co., Inc., Newark, N. J.
Genesee Valley Lithograph Co., Inc., Rochester, N. Y.
Humitube Mfg. Co., Peoria, Ill.
Mason Envelope Co., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Schmidt, Henry & Bro., Inc., Phila., Pa.
Stecher-Traung Lithograph Corp., Rochester, N. Y.

XUM

Tension Envelope Corp., New York, N. Y.
Tower Envelope Co., New York, N. Y.
U. S. Envelope Co., Kellogg Container Div., Springfield, Mass.
Wolf Bros., Phila., Pa.

POTTERY CONTAINERS

Andrews, O. B. Co., Chattanooga, Tenn.
Floramics Co., The, Tampa, Fla.
Greene's Ceramic Products Co., Inc., Sebring, Ohio
Hull, A. E. Pottery Co., Crooksville, Ohio
Na-Mac Products Corp., Los Angeles, Calif.
Ohio Boxboard Co., The, Rittman, Ohio
Purinton Pottery Co., Shippenville, Pa.
Robinson Clay Product Co., The, New York, N. Y.
Spaulding China Co., Inc., Sebring, Ohio
Western Stoneware Co., Monmouth, Ill.
Zanesville Stoneware Co., Zanesville, Ohio

SHIPPING CONTAINERS

(See Bags, Multiwall Heavy Duty)
(See Boxes, Corrugated & Solid Fibre)
(See Containers, Shipping, Weatherproof Corrugated)
(See Containers, Shipping, Weatherproof Fibre)
(See Drums—Fibre, Metal & Plywood)

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Loroco Industries, Inc., Reading, Ohio

TUBES, COLLAPSIBLE

(Aluminum, Lead, Tin & Alloys)

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Art Tube Co., Inc., Irvington, N. J.
National Collapsible Tube Co., Providence, R. I.
New England Collapsible Tube Co., Chicago, Ill.
Peerless Tube Co., Bloomfield, N. J.
Reynolds Metals Co., Richmond, Va.
Standard Specialty & Tube Co., New Brighton, Pa.
Sun Tube Corp., Hillside, N. J.
Turner White Metal Co., Inc., New Brunswick, N. J.
Victor Metal Products Corp., Bklyn, N. Y.
Wheeling Stamping Co., Wheeling, W. Va.
White Metal Mfg. Co., Hoboken, N. J.
Wirz, A. H. Inc., Chester, Pa.

TUBES, FIBRE

Beacon Container Co., New York, N. Y.
Burt, F. N. Co., Inc., Buffalo, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Canister Co., Inc., The, Phillipsburg, N. J.
Carpenter Container Corp., Bklyn, N. Y.
Cleveland Container Co., The, Cleveland, Ohio
Diamond Straw & Machine Co., New York, N. Y.
Fibreboard Products, Inc., San Francisco, Calif.
Gates Paper Co., Ltd., Los Angeles, Calif.
Heminway Corp., Waterbury, Conn.
Indianapolis Paper Container Corp., Indianapolis, Ind.
Loroco Industries, Inc., Reading, Ohio
Mercer Paper Tube, Inc., Trenton, N. J.
New England Collapsible Tube Co., Chicago, Ill.
Niemand Bros., Inc., Long Island City, N.Y.
Old Dominion Box Co., Inc., Charlotte, N. C.
R. C. Can Co., St. Louis, Mo.
Ritchie, W. C. & Co., Chicago, Ill.
Sefton Fibre Can Co., St. Louis, Mo.
Sutherland Paper Co., Kalamazoo, Mich.

TUBES, PLASTIC

Cambridge Paper Box Co., Cambridge, Mass.
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Crystal Tube Corp., Chicago, Ill.
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Humitube Mfg. Co., Peoria, Ill.
Hychex Products, Chicago, Ill.
Loroco Industries, Inc., Reading, Ohio
Lusteroid Container Co., Inc., S. Orange, N. J.
Mack Molding Co., Wayne, N. J.
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Transparent Specialties Corp., Cleveland, Ohio
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(Glass)

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Berman Bros., Inc., Chicago, Ill.
Corning Glass Works, Corning, N. Y.
Libby Glass Mfg. Co., Toledo, Ohio
Owens-Illinois Glass Co., Toledo, Ohio
Tygart Valley Glass Co., Washington, Pa.

VIALS, GLASS

Berman Bros., Inc., Chicago, Ill.
Brockway Glass Co., Inc., Brockway, Pa.
Glass Container & Cap Outlet Co., New York, N. Y.
Glass Industries, Inc., New York, N. Y.
Kimble Glass Co., Vineland, N. J.
Owens-Illinois Glass Co., Toledo, Ohio
Pennsylvania Glass Products Co., Pittsburgh, Pa.
Sager Bros., New York, N. Y.
Wheaton, T. C. Co., Millville, N. J.

VIALS, METAL

Aluminum Container Corp., Fulton, N. Y.
American Aluminum Ware Co., Newark, N. J.
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Clark, J. L. Mfg. Co., Rockford, Ill.
Sterling Seal Co., Erie, Pa.
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Victor Metal Products Corp., Bklyn, N. Y.

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Celluplastic Corp., Newark, N. J.
Design Center, Inc., Flushing, L. I., N. Y.
Loroco Industries, Inc., Reading, Ohio
Lusteroid Container Co., Inc., S. Orange, N. J.
Parfait Sales Co., Chicago, Ill.
Seaman Box Co., Inc., New York, N. Y.
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Link-Belt Co., Chicago, Ill.
Liquid Carbonic Corp., The, Chicago, Ill.
Logan Co., Louisville, Ky.
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Palmer, Frank D. Inc., Chicago, Ill.
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Weigh Right Automatic Scale Co., Joliet, Ill.

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(See Equipment, Materials Handling)

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Harris-Seybold Co., Cleveland, Ohio
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Ivers-Lee Co., Newark, N. J.
Kono-Mead, Flushing, N. Y.
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Modern Containers Co., Los Angeles, Calif.
Palmer, Frank D. Inc., Chicago, Ill.
Peters Machinery Co., Chicago, Ill.
Potdevin Machine Co., Bklyn, N. Y.
Seal-Craft, Inc., Newark, N. J.
Simplex Wrapping Machine Co., Oakland, Calif.
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New Jersey Machine Corp., Hoboken, N. J.
Parry, Samuel R. Machine Co., Rochester, N. Y.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Stokes & Smith Co., Phila., Pa.
U. S. Automatic Box Machinery Co., Inc., Boston, Mass.

MACHINES, BOX WINDOW APPLYING

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Chambon, L. Corp., New York, N. Y.
International Paper Box Machine Co., Nashua, N. H.
Knowlton, M. D. Co., Rochester, N. Y.
New Jersey Machine Corp., Hoboken, N. J.
Smithe, F. L. Machine Co., Inc., New York, N. Y.
Staude, E. G. Mfg. Co., St. Paul, Minn.

MACHINES, CAN CAPPING

Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Crown Cork & Seal Co., Baltimore, Md.
Elgin Mfg. Co., Elgin, Ill.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
Liquid Carbonic Corp., The, Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Scientific Filter Co., New York, N. Y.
U. S. Bottlers Machinery Co., Chicago, Ill.

MACHINES, CAN CLOSING & SEALING

American Can Co., New York, N. Y.
Ams, Max Machine Co., The, Bridgeport, Conn.
Canister Co., Inc., The, Phillipsburg, N. J.
Continental Can Co., Inc., New York, N. Y.
Crown Can Co., Phila., Pa.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Gates Paper Ltd., Los Angeles, Calif.
Heekin Can Co., Cincinnati, Ohio
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
National Can Corp., New York, N. Y.

MACHINES, CAN FILLING, LIQUID

Alsop Engineering Corp., New York, N. Y.
Colton, Arthur Co., Detroit, Mich.
Continental Can Co., Inc., New York, N. Y.
Crown Can Co., Phila., Pa.
Elgin Mfg. Co., Elgin, Ill.
Ertel Engineering Corp., Kingston, N. Y.
Food Machinery Corp., Hoopeston, Ill.
Horix Mfg. Co., Pittsburgh, Pa.
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
Liquid Carbonic Corp., The, Chicago, Ill.
Mojonnier Bros. Co., Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Scientific Filter Co., New York, N. Y.
Stokes, F. J. Machine Co., Phila., Pa.
Tanzi, Aurelio Engineering Co., Bklyn., N. Y.
U. S. Bottlers Machinery Co., Chicago, Ill.
Vol-U-Meter Co., The, Buffalo, N. Y.

MACHINES, CAN LABELING

Burt Machine Co., Baltimore, Md.
Chisholm-Ryder Co. of Pa., Hanover, Pa.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Glue Fast Equipment Co., Inc., New York, N. Y.
Knowlton, M. D. Co., Rochester, N. Y.
Liquid Carbonic Corp., The, Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Potdevin Machine Co., Bklyn, N. Y.
Scientific Filter Co., New York, N. Y.
Vertex Co., New York, N. Y.

MACHINES, CAN WRAPPING

Burt Machine Co., Baltimore, Md.
Ferguson, J. L. Co., Joliet, Ill.
Hudson Sharp Machine Co., Green Bay, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Package Machinery Co., Springfield, Mass.
Redington, F. B. Co., Chicago, Ill.

MACHINES, CAP & COVER LINING

Ams, Max Machine Co., Bridgeport, Conn.
Dewey & Almy Chemical Co., Cambridge, Mass.
Johnson, A. Machine Works, Bklyn, N. Y.

MACHINES, CAPPING

Aluminum Seal Co., New Kensington, Pa.
American Seal-Kap Corp., Long Island City, N. Y.
Anchor Hocking Glass Corp., Lancaster, Ohio
Aridor Co., The, Chicago, Ill.
Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Crown Cork & Seal Co., Baltimore, Md.
Elgin Mfg. Co., Elgin, Ill.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Goat, Fred Co., Inc., The, Bklyn, N. Y.
Heekin Can Co., Cincinnati, Ohio
Horix Mfg. Co., Pittsburgh, Pa.
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
Liquid Carbonic Corp., The, Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Resina Automatic Machinery Co., Inc., Bklyn, N. Y.
Scientific Filter Co., New York, N. Y.
Sealright Co., Inc., Fulton, N. Y.
Sterling Seal Co., Erie, Pa.
U. S. Bottlers Machinery Co., Chicago, Ill.

MACHINES, CAPSULE WRAPPING

Ivers-Lee Co., Newark, N. J.

MACHINES, CARTON FORMING, LINING, FILLING, FOLDING, CLOSING & SEALING

Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich.
Bostitch, Inc., E. Greenwich, R. I.
Container Equipment Corp., Newark, N. J.
Ex-Cell-O Corp., Detroit, Mich.
Ferguson, J. L. Co., Joliet, Ill.
Harris-Seybold Co., Cleveland, Ohio
Interstate Folding Box Co., Middletown, Ohio
Jones, R. A. & Co., Cincinnati, Ohio
National Metal Edge Box Co., Phila., Pa.
Pack-Rite Machines, Milwaukee, Wis.
Palmer, Frank D. Inc., Chicago, Ill.
Peters Machinery Co., Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Redington, F. B. Co., Chicago, Ill.
Ross, A. H. Co., Inc., Ludlow, Ky.
Stokes & Smith Co., Phila., Pa.
Triangle Package Machinery Co., Chicago, Ill.
U. S. Automatic Box Machinery Co., Inc., Boston, Mass.
Weigh Right Automatic Scale Co., Joliet, Ill.
Waldorf Paper Products Co., St. Paul, Minn.
Western Waxed Paper Co., Los Angeles, Calif.

MACHINES, CARTON LOADING

(Cartoners)

A B C Packaging Machine Corp., Quincy, Ill.
Burt Machine Co., Baltimore, Md.
Container Equipment Corp., Newark, N. J.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Goat, Fred Co., Inc., The, Bklyn, N. Y.
Island Equipment Corp., New York, N. Y.
Jeffrey Mfg. Co., The, Columbus, Ohio
Jones, R. A. & Co., Cincinnati, Ohio
Redington, F. B. Co., Chicago, Ill.
Ross, A. H. Co., Inc., Ludlow, Ky.
U. S. Automatic Box Machinery Co., Inc., Boston, Mass.
Western Waxed Paper Co., Los Angeles, Calif.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, CASE LOADING

Burt Machine Co., Baltimore, Md.
Chisholm-Ryder Co. of Pa., Hanover, Pa.
Container Equipment Corp., Newark, N. J.

Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Island Equipment Corp., New York, N. Y.
Standard-Knapp Corp., Portland, Conn.

MACHINES, CASE PRINTING

Ferguson, J. L. Co., Joliet, Ill.
Gottscho, Adolph Inc., New York, N. Y.
Hooper, F. X. Co., Inc., Glenarm, Md.
Langston, Samuel M. Co., Camden, N. J.
Standard-Knapp Corp., Portland, Conn.
Swift, G. W. Jr., Inc., Bordentown, N. J.

MACHINES, CASE SEALING

(Glue)

A B C Packaging Machine Co., Quincy, Ill.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
Standard-Knapp Corp., Portland, Conn.

MACHINES, CASE SEALING

(Gummed Tape)

Arenco Machine Co., Inc., New York, N. Y.
Better Packages, Inc., Shelton, Conn.
Gummed Tape & Devices Co., Bklyn, N. Y.
Nashua Packaged Sealing Co., Inc., Nashua, N. H.
Seal, Inc., Shelton, Conn.
Vertex Co., New York, N. Y.

MACHINES, CASE STITCHING

Acme Staple Co., Camden, N. J.
Acme Steel Co., Chicago, Ill.
Bostitch, Inc., E. Greenwich, R. I.
Dexter Folder Co., New York, N. Y.
Globe Manufacturing Co., Phila., Pa.
Harris-Seybold Co., Cleveland, Ohio
Heller Co., The, Cleveland, Ohio
International Staple & Machine Co., Clifton Heights, Pa.
Saranac Machine Co., Benton Harbor, Mich.

MACHINES, CASE UNLOADING

Ferguson, J. L. Co., Joliet, Ill.
Horix Mfg. Co., Pittsburgh, Pa.
Island Equipment Corp., New York, N. Y.
Standard-Knapp Corp., Portland, Conn.

MACHINES, CELLULOSE BAND APPLYING

American Machine & Foundry Co., New York, N. Y.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, CELLULOSE TUBE MAKING

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Diamond Straw & Machine Co., New York, N. Y.
Heat Seal-It Co., Phila., Pa.
Hulbert Engineering Corp., Watertown, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Potdevin Machine Co., Bklyn, N. Y.
Simplex Wrapping Machine Co., Oakland, Calif.

MACHINES, COATING

(Lacquer & Varnish)

Chambon, L. Corp., New York, N. Y.
Haida Engineering Co., Long Island City, N. Y.
Hudson Sharp Machine Co., Green Bay, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Marconetti, A. E. Inc., New York, N. Y.
Miskella Infra-Red Co., Cleveland, Ohio
Norwood Engineering Co., The, Florence, Mass.
Rotogravure Engineering Co., New York, N. Y.
Rutherford Machinery Co., Div., Sun Chemical Corp., New York, N. Y.
Waldron, John Corp., New Brunswick, N. J.

MACHINES, COATING

(Wax and Hot Melt)

Aeroil Burner Co., Inc., W. New York, N. J.
Chambon, L. Corp., New York, N. Y.
Container Equipment Corp., Newark, N. J.
Gellman Mfg. Co., Rock Island, Ill.
Haida Engineering Co., Long Island City, N. Y.
Hudson Sharp Machine Co., Green Bay, Wis.
International Paper Box Machine Co., Nashua, N. H.
Knowlton, M. D. Co., Rochester, N. Y.
Miskella Infra-Red Co., Cleveland, Ohio
Norwood Engineering Co., The, Florence, Mass.
Potdevin Machine Co., Bklyn, N. Y.
Rotogravure Engineering Co., New York, N. Y.
Standard Process Corp., Chicago, Ill.
Sta-Warm Electric Co., Ravenna, Ohio
Waldron, John Corp., New Brunswick, N. J.

MACHINES, COLLAPSIBLE TUBE FILLING & SEALING

Arenco Machine Co., Inc., New York, N. Y.
Colton, Arthur Co., Detroit, Mich.
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
Stokes, F. J. Machine Co., Phila., Pa.

MACHINES, CORKING

Ermold, Edward Co., New York, N. Y.
Horix Mfg. Co., Pittsburgh, Pa.
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
Resina Automatic Machinery Co., Inc., Bklyn, N. Y.
U. S. Bottlers Machinery Co., Chicago, Ill.

MACHINES, COTTON INSERTING

Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Lakso Company, The, Fitchburg, Mass.

MACHINES, COUNTING

Ayers, John W. & Son, Bloomfield, N. J.
Colton, Arthur Co., Detroit Mich.
Maxson Automatic Machinery Co., Westerly, R. I.
Ottaway, C. L. Mfg. Co., Monrovia, Calif.
Palmer, Frank D. Inc., Chicago, Ill.
Redington, F. B. Co., Chicago, Ill.
Triangle Package Machinery Co., Chicago, Ill.
Veeder-Root, Inc., Hartford, Conn.

MACHINES, CRIMPING, COLLAPSIBLE TUBE

Arenco Machine Co., Inc., New York, N. Y.
Colton, Arthur Co., Detroit, Mich.
Knowlton, M. D. Co., Rochester, N. Y.
Pack-Rite Machine Corp., Milwaukee, Wis.
Stokes, F. J. Machine Co., Phila., Pa.
Wrapade Machine Co., Bklyn, N. Y.

MACHINES, CRIMPING & SEALING

Ams, Max Machine Co., Bridgeport, Conn.
Amsco Packaging Machinery Inc., Long Island City, N. Y.
Cleveland Crimping Press Co., Cleveland, Ohio
Cleveland Lathe & Machine Co., Cleveland, Ohio
Codie Kay, Los Angeles, Calif.
Colton, Arthur Co., Detroit, Mich.
Gump, B. F. Co., Chicago, Ill.
Heat Seal-It Co., Phila., Pa.
Ivers-Lee Co., Newark, N. J.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Package Machinery Co., Springfield, Mass.
Pack-Rite Machines, Milwaukee, Wis.
Sav-Way Industries, Detroit, Mich.
Seal-Craft, Inc., Newark, N. J.
Simplex Wrapping Machine Co., Oakland, Calif.
Stokes, F. J. Machine Co., Phila., Pa.
Wells Mfg. Co., San Francisco, Calif.
Wrapade Machine Co., Inc., Bklyn, N. Y.

MACHINES, CRIMPING, SEAMING FIBRE CANS

Ams, Max Machine Co., Bridgeport, Conn.
Knowlton, M. D. Co., Rochester, N. Y.
Paslode Co., Chicago, Ill.

MACHINES, DIE CUTTING

Ayers, John W. & Son, Bloomfield, N. J.
Chambon, L. Corp., New York, N. Y.
Globe Mfg., Phila., Pa.
Goat, Fred Co., Inc., The, Bklyn, N. Y.
Harris-Seybold Co., Cleveland, Ohio
Hulbert Engineering Corp., Watertown, Wis.
Lansky Die Cutting Co., New York, N. Y.
Miller Printing Machinery Co., Pittsburgh, Pa.
Parry, Samuel R. Machine Co., Rochester, N. Y.
Smith & Winchester Mfg. Co., The, S. Windham, Conn.
Staude, E. G. Mfg. Co., St. Paul, Minn.

MACHINES, DOMING

(Boxes)

Beck, Charles Machine Co., Phila., Pa.
Globe Mfg. Co., Phila., Pa.
Hulbert Engineering Corp., Watertown, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Lansky Die Cutting Co., New York, N. Y.

MACHINES, EMBOSSING

Chambon, L. Corp., New York, N. Y.
Coughlin Manufacturing Co., New York, N. Y.
Force, Wm. A. & Co., Inc., Bklyn, N. Y.
Harris-Seybold Co., Cleveland, Ohio
Hudson Sharp Machine Co., Green Bay, Wis.
Knowlton, M. D., Co., Rochester, N. Y.
Lansky Die Cutting Co., New York, N. Y.
Marconetti, A. E. Inc., New York, N. Y.
Markem Machine Co., Keene, N. H.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Norwood Engineering Co., The, Florence, Mass.
Paper Converting Machine Co., Green Bay, Wis.
Peerless Roll Leaf Co., Inc., Union City, N. J.
Rutherford Machinery Co., Div., Sun Chemical Corp., New York, N. Y.
Unicrafts, Inc., Amherst, Mass.
Waldron, John Corp., New Brunswick, N. J.

MACHINES, FIBRE CAN MAKING

Chambon, L. Corp., New York, N. Y.
Ferguson, J. L. Co., Joliet, Ill.
Hulbert Engineering Corp., Watertown, Wis.

Addresses of companies listed appear on pages 1022–1033

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Knowlton, M. D. Co., Rochester, N. Y.
Langston, Samuel M. Co., Camden, N. J.

MACHINES, FILLING, DRY

(Gross and Net Weight)

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Arenco Machine Co., Inc., New York, N. Y.
Automatic Scale Co., Inc., New York, N. Y.
Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich.
Codie Kay, Los Angeles, Calif.
Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Ferguson, J. L. Co., Joliet, Ill.
Goat, Fred Co., Inc., The, Bklyn, N. Y.
Gump, B. F. Co., Chicago, Ill.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
St. Regis Paper Co., New York, N. Y.
Stokes, F. J. Machine Co., Phila., Pa.
Stokes & Smith Co., Phila., Pa.
Syntron Co., Homer City, Pa.
Triangle Package Machinery Co., Chicago, Ill.
U. S. Automatic Box Machinery Co., Inc., Boston, Mass.
Weigh Right Automatic Scale Co., Joliet, Ill.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, FILLING, DRY

(Volumetric)

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Arenco Machine Co., Inc., New York, N. Y.
Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich.
Brown Bag Filling Machine Co., The, Fitchburg, Mass.
Carter Engineering Co., Danville, Ill.
Codie Kay, Los Angeles, Calif.
Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Goat, Fred Co., Inc., The, Bklyn, N. Y.
Jeffrey Mfg. Co., The, Columbus, Ohio
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Mojonnier Bros. Co., Chicago, Ill.
Palmer, Frank D. Inc., Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Stokes, F. J. Machine Co., Phila., Pa.
Stokes & Smith Co., Phila., Pa.
Syntron Co., Homer City, Pa.
Tanzi, Aurelio Engineering Co., Bklyn, N. Y.
Triangle Package Machinery Co., Chicago, Ill.
U. S. Automatic Box Machinery Co., Inc., Boston, Mass.
Weigh Right Automatic Scale Co., Joliet, Ill.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, FILLING, LIQUID

Alsop Engineering Corp., Milldale, Conn.
Arenco Machine Co., Inc., New York, N. Y.
Continental Can Co., Inc., New York, N. Y.
Crown Cork & Seal Co., Baltimore, Md.
Elgin Mfg. Co., Elgin, Ill.
Food Machinery Corp., Hoopeston, Ill.
Horix Mfg. Co., Pittsburgh, Pa.
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
Liquid Carbonic Corp., The, Chicago, Ill.
M. R. M. Co., New York, N. Y.
Mojonnier Bros. Co., Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Scientific Filter Co., New York, N. Y.
Stokes, F. J. Machine Co., Phila., Pa.
Tanzi, Aurelio Engineering Co., Bklyn, N. Y.
U. S. Bottlers Machinery Co., Chicago, Ill.
Vol-U-Meter Co., The, Buffalo, N. Y.

MACHINES, FILLING, SEMI-LIQUID

(Viscose)

Arenco Machine Co., Inc., New York, N. Y.
Continental Can Co., Inc., New York, N. Y.
Elgin Mfg. Co., New York, N. Y.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Horix Mfg. Co., Pittsburgh, Pa.
Kiefer, Karl Machine Co., The, Cincinnati, Ohio
M. R. M. Co., New York, N. Y.
Mojonnier Bros. Co., Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Scientific Filter Co., New York, N. Y.
Stokes, F. J. Machine Co., Phila., Pa.
U. S. Bottlers Machinery Co., Chicago, Ill.
Vol-U-Meter Co., The, Buffalo, N. Y.

MACHINES, GUMMED TAPE

Better Packages, Inc., Shelton, Conn.
Glue Fast Equipment Co., Inc., New York, N. Y.
Gummed Tape & Devices Co., Bklyn, N. Y.
Haida Engineering Co., Long Island City, N. Y.
Knowlton, M. D. Co., Rochester, N. Y.
Nashua Package Sealing Co., Inc., Nashua, N. H.
Paper Converting Machine Co., Green Bay, Wis.

MACHINES, HEAT SEALING

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Automatic Scale Co., Inc., New York, N. Y.
Betner, Benj. C. Co., Devon, Pa.
Cleveland Lathe & Machine Co., Cleveland, Ohio
Codie Kay, Los Angeles, Calif.
Gump, B. F. Co., Chicago, Ill.
Hayssen Mfg. Co., Sheboygan, Wis.
Heat Seal-It Co., Phila., Pa.
Ivers-Lee Co., Newark, N. J.
Kono-Mead, Flushing, L. I.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Miskella Infra-Red Co., Cleveland, Ohio
Oliver Machinery Co., Grand Rapids, Mich.
Package Machinery Co., Springfield, Mass.
Pack-Rite Machines, Milwaukee, Wis.
Palmer, Frank D. Inc., Chicago, Ill.
Redington, F. B. Co., Chicago, Ill.
Sav-Way Industries, Detroit, Mich.
Scandia Mfg. Co., N. Arlington, N. J.
Seal-Craft, Inc., Newark, N. J.
Simplex Wrapping Machine Co., Oakland, Calif.
Singer Sewing Machine Co., New York, N.Y.
Sta-Warm Electric Co., Ravenna, Ohio
Stokes & Smith Co., Phila., Pa.
Vertex Co., New York, N. Y.
Wrapade Machine Co., Inc., Bklyn, N. Y.

MACHINES, HEAT SEALING

(Hand Irons)

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Cleveland Lathe & Machine Co., Cleveland, Ohio
Dennison Mfg. Co., Framingham, Mass.
Diaphane Bag Corp. of Pa., Phila., Pa.
Heat Seal-It Co., Phila., Pa.
M & R Mfg. Co., Mansfield, Ohio
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Pack-Rite Machines, Milwaukee, Wis.
Simplex Wrapping Machine Co., Oakland, Calif.
Sta-Warm Electric Co., Ravenna, Ohio
Watlow Electric Mfg. Co., St. Louis, Mo.
Wells Mfg. Co., San Francisco, Calif.

MACHINES, HOODING

Package Machinery Co., Springfield, Mass.
Sealright Co., Inc., Fulton, N. Y.

MACHINES, LABEL GUMMING

Diagraph-Bradley Stencil Machine Corp., St. Louis, Mo.
Globe Manufacturing Co., Phila., Pa.
Glue Fast Equipment Co., Inc., New York, N. Y.
Grammes, L. F. & Sons, Inc., Allentown, Pa.
Knowlton, M. D. Co., Rochester, N. Y.
New Jersey Machine Corp., Hoboken, N. J.
Parry, Samuel R. Machine Co., Rochester, N. Y.
Potdevin Machine Co., Bklyn, N. Y.

MACHINES, LABELERS

Alsop Engineering Corp., Milldale, Conn.
American Machine & Foundry Co., New York, N. Y.
Arenco Machine Co., Inc., New York, N. Y.
Burt Machine Co., Baltimore, Md.
Chisholm-Ryder Co. of Pa., Hanover, Pa.
Diagraph Bradley Stencil Machine Corp., St. Louis, Mo.
Economic Machinery Co., Worcester, Mass.
Ermold, Edward Co., New York, N. Y.
Ever Ready Label Corp., New York, N. Y.
Ferguson, J. L. Co., Joliet, Ill.
Food Machinery Corp., Hoopeston, Ill.
Gellman Mfg. Co., Rock Island, Ill.
Globe Mfg. Co., Phila., Pa.
Glue Fast Equipment Co., Inc., New York, N. Y.
Grammes, L. F. & Sons, Inc., Allentown, Pa.
Gummed Tape & Devices Co., Bklyn, N. Y.
Haida Engineering Co., Long Island City, N. Y.
Knowlton, M. D. Co., Rochester, N. Y.
Liquid Carbonic Corp., The, Chicago, Ill.
Nashua Package Sealing Co., Inc., Nashua, N. H.
New Jersey Machine Corp., Hoboken, N. J.
Oliver Machinery Co., Grand Rapids, Mich.
Paper Converting Machine Co., Green Bay, Wis.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Potdevin Machine Co., Bklyn, N. Y.
Redington, F. B. Co., Chicago, Ill.
Scientific Filter Co., New York, N. Y.
Standard-Knapp Corp., Portland, Conn.
U. S. Bottlers Machinery Co., Chicago, Ill.
Vac-Spray Machine Co., Minneapolis, Minn.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, LABELING ATTACHMENTS

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich.
Chisholm-Ryder Co. of Pa., Hanover, Pa.
Economic Machinery Co., Worcester, Mass.
Glue Fast Equipment Co., Inc., New York, N. Y.
Liquid Carbonic Corp., The, Chicago, Ill.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Nashua Package Sealing Co., Inc., Nashua, N. H.

New Jersey Machine Corp., Hoboken, N. J.
Oliver Machinery Co., Grand Rapids, Mich.
Package Machinery Co., Springfield, Mass.
Simplex Wrapping Machine Co., Oakland, Calif.
U. S. Bottlers Machinery Co., Chicago, Ill.

MACHINES, LAMINATING

Chambon, L. Corp., New York, N. Y.
Haida Engineering Co., Long Island City, N. Y.
Henschel, C. B. Mfg. Co., Milwaukee, Wis.
Hudson Sharp Machine Co., Green Bay, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Marconetti, A. E. Inc., New York, N. Y.
Meisel Press Mfg. Co., Boston, Mass.
Norwood Engineering Co., The, Florence, Mass.
Parry, Samuel R. Machine Co., Rochester, N. Y.
Rotogravure Engineering Co., New York, N. Y.
Waldron, John Corp., New Brunswick, N. J.

MACHINES, MARKING

(Box & Carton)

Diagraph-Bradley Stencil Machine Co., St. Louis, Mo.
Ferguson, J. L. Co., Joliet, Ill.
Force, Wm. A. & Co., Inc., Bklyn, N. Y.
Gottscho, Adolph Inc., New York, N. Y.
Markem Machine Co., Keene, N. H.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Melind, Louis Co., Chicago, Ill.
Peerless Roll Leaf Co., Inc., Union City, N. J.
Superior Marking Equipment, Chicago, Ill.
Vertex Co., New York, N. Y.

MACHINES, METAL EDGE STAYING

National Metal Edge Box Co., Phila., Pa.

MACHINES, NUMBERING, PRINTING OR PERFORATING

American Perforator Co., The Chicago, Ill.
Bates Mfg. Co., The, New York, N. Y.
Chambon, L. Corp., New York, N. Y.
Force, Wm. A. & Co., Inc., Bklyn, N. Y.
Gottscho, Adolph Inc., New York, N. Y.
Markem Machine Co., Keene, N. H.
Meisel Press Mfg. Co., Boston, Mass.
Melind, Louis Co., Chicago, Ill.
Miller Printing Machinery Co., Pittsburgh, Pa.
New Jersey Machine Corp., Hoboken, N. J.
Oliver Machinery Co., Grand Rapids, Mich.
Standard-Knapp Corp., Portland, Conn.

MACHINES, PACKET FILLING

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Arenco Machine Co., Inc., New York, N. Y.
Automatic Scale Co., Inc., New York, N. Y.
Brown Bag Filling Machine Co., The, Fitchburg, Mass.
Ferguson, J. L. Co., Joliet, Ill.
Gump, B. F. Co., Chicago, Ill.
Hulbert Engineering Corp., Watertown, Wis.
Ivers-Lee Co., Newark, N. J.
Redington, F. B. Co., Chicago, Ill.
Stokes & Smith, Co., Phila., Pa.
Tanzi, Aurelio Engineering Co., Bklyn, N. Y.
Triangle Package Machinery Co., Chicago, Ill.
U. S. Automatic Box Machinery Co., Inc., Boston, Mass.
Weigh Right Automatic Scale Co., Joliet, Ill.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, PAPER BAG FEEDING, OPENING, WEIGHING & CLOSING

(Automatic)

Arenco Machine Co., Inc., New York, N. Y.
Bemis Bro. Bag Co., St. Louis, Mo.
Betner, Benj. C. Co., Devon, Pa.
Consolidated Packaging Machinery Co., Buffalo, N. Y.
Gump, B. F. Co., Chicago, Ill.
Palmer, Frank D. Inc., Chicago, Ill.
Redington, F. B. Co., Chicago, Ill.
St. Regis Paper Co., New York, N. Y.
Stokes & Smith Co., Chicago, Ill.
Triangle Package Machinery Co., Chicago, Ill.
Weber, H. G. & Co., Inc., Kiel, Wis.
Weigh Right Automatic Scale Co., Joliet, Ill.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, PAPER BOTTLE MAKING

Arenco Machine Co., Inc., New York, N. Y.
Chambon, L. Corp., New York, N. Y.
International Paper Box Machine Co., Nashua, N. H.
Knowlton, M. D. Co., Rochester, N. Y.
National Metal Edge Box Co., Phila., Pa.
Sealright Co., Inc., Fulton, N. Y.

MACHINES, PAPER ROLL FEEDING

Cameron Machine Co., Bklyn, N. Y.
Chambon, L. Corp., New York, N. Y.
Knowlton, M. D. Co., Rochester, N. Y.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Modern Equipment Corp., Defiance, Ohio
Package Machinery Co., Springfield, Mass.
Paper Converting Machine Co., Green Bay, Wis.
Smith & Winchester Mfg. Co., The, S. Windham, Conn.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, PAPER SHREDDING

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Industrial Shredder & Cutter Co., Salem, Ohio
Shamrock Co., The, St. Louis, Mo.
Stokes, F. J. Machine Co., Phila., Pa.

MACHINES, PARTITION ASSEMBLING

Hooper, F. X. Co., Inc., Glenarm, Md.
Inman Mfg. Co., Inc., Amsterdam, N. Y.
Standard-Knapp Corp., Portland, Conn.

MACHINES, PREFORMING & TABLETTING

Colton, Arthur Co., Detroit, Mich.
Stokes, F. J. Machine Co., Phila., Pa.

MACHINES, REVENUE STAMP

American Perforator Co., The, Chicago, Ill.
Arenco Machine Co., Inc., New York, N. Y.
Ermold, Edward Co., New York, N. Y.
New Jersey Machine Corp., Hoboken, N. J.
Scandia Mfg. Co., N. Arlington, N. J.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, RIGID TRANSPARENT FABRICATING

(All Types)

Globe Mfg. Co., Phila., Pa.
Hulbert Engineering Corp., Watertown, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Smith, F. L. Machine Co., New York, N. Y.
Taber Instrument Corp., N. Tonawanda, N. Y.

MACHINES, ROLL LEAF STAMPING

Coughlin Mfg. Co., New York, N. Y.
Griffin, Campbell, Hayes, Walsh, Inc., New York, N. Y.
Markem Machine Co., Keene, N. H.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Peerless Roll Leaf Co. Inc., Union City, N. J.

MACHINES, ROLL SLITTERS & REWINDERS

Beck, Chas. Machine Co., Phila., Pa.
Cameron Machine Co., Bklyn, N. Y.
Chambon, L. Corp., New York, N. Y.
Globe Mfg. Co., Phila., Pa.
Kidder Press Co., Inc., Dover, N. H.
Knowlton, M. D. Co., Rochester, N. Y.
Langston, Samuel M. Co., Camden, N. J.
Meisel Press Mfg. Co., Boston, Mass.
Norwood Engineering Co., The, Florence, Mass.
Paper Converting Machine Co., Green Bay, Wis.
Rotogravure Engineering Co., New York, N. Y.

MACHINES, SHEET FEEDING

Marconetti, A. E. Inc., New York, N. Y.
Package Machinery Co., Springfield, Mass.
Wright's Automatic Machinery Co., Durham, N. C.

MACHINES, SHEETING

Abana Products, Chicago, Ill.
Amsco Packaging Machinery Inc., Long Island City, N. Y.
Beck, Chas. Machine Co., Phila., Pa.
Globe Mfg. Co., Phila., Pa.
Hudson Sharp Machine Co., Green Bay, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Maxson Automatic Machinery Co., Westerly, R. I.
Meisel Press Mfg. Co., Boston, Mass.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Oliver Machinery Co., Grand Rapids, Mich.
Parry, Samuel R. Machine Co., Rochester, N. Y.
Peters Machinery Co., Chicago, Ill.
Rotogravure Engineering Co., New York, N. Y.
Smith & Winchester Mfg. Co., S. Windham, Conn.
Wrapade Machine Co., Inc., Bklyn, N. Y.

MACHINES, SPIRAL WRAPPING

Angier Corp., Framingham, Mass.
Ferguson, J. L. Co., Joliet, Ill.
Hudson Sharp Machine Co., Green Bay, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Langston, Samuel A. Co., Camden, N. J.
Paper Converting Machine Co., Green Bay, Wis.
Terkelsen Machine Co., Boston, Mass.
Vertex Co., New York, N. Y.

MACHINES, SPOUT INSERTING

Seal-Spout Corp., Newark, N. J.

MACHINES, STACKING

Jeffrey Manufacturing Co., The, Columbus, Ohio
Rapids-Standard Co., Inc., The, Grand Rapids, Mich.

Addresses of companies listed appear on pages 1022–1033

XUM

MACHINES, STAPLING

Acme Staple Co., Camden, N. J.
Acme Steel Co., Chicago, Ill.
Bostitch, Inc., E. Greenwich, R. I.
Burgess Fastening Co., The, Cleveland, Ohio
Globe Manufacturing Co., Phila., Pa.
Harris-Seybold Co., Cleveland, Ohio
Heller Co., The, Cleveland, Ohio
International Staple & Machine Co., Clifton Heights, Pa.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Paslode Co., Chicago, Ill.
Saranac Machine Co., Benton Harbor, Mich.
Seymour & Peck Co., Chicago, Ill.

MACHINES, STATIC ELIMINATING

Maxson Automatic Machinery Co., Westerly, R. I.
Simco Co., The, Phila., Pa.

MACHINES, STENCIL CUTTING

Diagraph-Bradley Stencil Machine Corp., St. Louis, Mo.
Ideal Stencil Machine Co., Belleville, Ill.
Marsh Stencil Machine Co., Belleville, Ill.
Matthews, J. H. & Co., Pittsburgh, Pa.

MACHINES, TABLET COUNTING & PACKAGING

Ayers, John W. & Son, Bloomfield, N. J.
Chambon, L. Corp., New York, N. Y.
Colton, Arthur Co., Detroit, Mich.
Hulbert Engineering Corp., Watertown, Wis.
Ivers-Lee Co., Newark, N. J.
Lakso Co., The, Fitchburg, Mass.
Palmer, Frank D. Inc., Chicago, Ill.
Redington, F. B. Co., Chicago, Ill.
Stokes, F. J. Machine Co., Phila., Pa.
Stokes & Smith Co., Phila., Pa.
Triangle Package Machinery Co., Chicago, Ill.

MACHINES, TAPE DISPENSERS

Better Packages, Inc., Shelton, Conn.
Chicago Gum Tape Co., Chicago, Ill.
Gummed Tape & Devices Co., Bklyn, N. Y.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Nashua Package Sealing Co., Inc., Nashua, N. H.

MACHINES, TAPE SEALING

Better Packages, Inc., Shelton, Conn.
Chicago Gum Tape Co., Chicago, Ill.
Gummed Tape & Devices Co., Bklyn, N. Y.
Ivers-Lee Co., Newark, N. J.
Nashua Package Sealing Co., Inc., Nashua, N. H.
Package Machinery Co., Springfield, Mass.
Vertex Co., New York, N. Y.

MACHINES, TEA BAG

Ivers-Lee Co., Newark, N. J.
Pneumatic Scale Corp., Ltd., N. Quincy, Mass.
Potdevin Machine Co., Bklyn, N. Y.
Stokes & Smith Co., Phila., Pa.

MACHINES, TIGHT WRAPPING

(For Carton Shells)

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Pneumatic Scale Corp., Ltd., N. Quincy, Mass.
Stokes & Smith Co., Phila., Pa.

MACHINES, TUBE LACQUERING, VARNISHING & PRINTING

Markem Machine Co., Keene, N. H.
Miskella Infra-Red Co., Cleveland, Ohio
Rotogravure Engineering Co., New York, N. Y.
Rutherford Machinery Co., Div., Sun Chemical Corp., New York, N. Y.

MACHINES, TYING

Bunn, B. H. Co., Chicago, Ill.
Gerrard Steel Strapping Co., Chicago, Ill.
Globe Mfg. Co., Phila., Pa.
Vertex Co., New York, N. Y.

MACHINES, UNIT FORMING & FILLING

Ivers-Lee Co., Newark, N. J.
Stokes & Smith Co., Phila., Pa.

MACHINES, UNSCRAMBLING

A B C Packing Machine Co., Quincy, Ill.
Burt Machine Co., Baltimore, Md.
Chisholm-Ryder Co. of Pa., Hanover, Pa.
Crown Cork & Seal Co., Baltimore, Md.
Food Machinery Corp., Hoopeston, Ill.
Horix Mfg. Co., Pittsburgh, Pa.
Island Equipment Corp., New York, N. Y.
Palmer, Frank D. Inc., Chicago, Ill.
Standard-Knapp Corp., Portland, Conn.

MACHINES, VIBRATORS

(For Packing & Settling)

Gump, B. F. Co., Chicago, Ill.
Jeffrey Mfg. Co., The, Columbus, Ohio
Syntron Co., Homer City, Pa.

MACHINES, WINDING

Cameron Machine Co., Bklyn, N. Y.
Hudson Sharp Machine Co., Green Bay, Wis.
Knowlton, M. D. Co., Rochester, N. Y.
Paper Converting Machine Co., Green Bay, Wis.
Waldron, John Corp., New Brunswick, N. J.

MACHINES, WIRE STAPLING

Acme Staple Co., Camden, N. J.
Acme Steel Co., Chicago, Ill.
Bates Mfg. Co., The, New York, N. Y.
Bostitch, Inc., E. Greenwich, R. I.
Burgess Fastening Co., The, Cleveland, Ohio
Globe Mfg. Co., Phila., Pa.
Harris-Seybold Co., Cleveland, Ohio
Heller Co., The, Cleveland, Ohio
Ideal Stitcher & Mfg. Co., Racine, Wis.
International Staple & Machine Co., Clifton Heights, Pa.
Paslode Co., Chicago, Ill.
Saranac Machine Co., Benton Harbor, Mich.

MACHINES, WIRE STITCHING

Acme Steel Co., Chicago, Ill.
Bostitch, Inc., E. Greenwich, R. I.
Burgess Fastening Co., Cleveland, Ohio
Dexter Folder Co., New York, N. Y.
Globe Mfg. Co., Phila., Pa.
Harris-Seybold Co., Cleveland, Ohio
Heller Co., The, Cleveland, Ohio
Ideal Stitcher & Mfg. Co., Racine, Wis.
International Paper Box Machine Co., Nashua, N. H.
Knowlton, M. D. Co., Rochester, N. Y.
Paslode Co., Chicago, Ill.
Saranac Machine Co., Benton Harbor, Mich.

MACHINES, WRAPPING

American Machine & Foundry Co., New York, N. Y.
Amsco Packaging Machinery Inc., Long Island City, N. Y.
Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich.
Burt Machine Co., Baltimore, Md.
Gellman Mfg. Co., Rock Island, Ill.
Globe Mfg. Co., Phila., Pa.
Hayssen Mfg. Co., Sheboygan, Wis.
Hudson Sharp Machine Co., Green Bay, Wis.
Lynch Package Machinery Corp., Toledo, Ohio
Maxson Automatic Machinery Co., Westerly, R. I.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
National Bread Wrapping Machine Co., Springfield, Mass.
Oliver Machinery Co., Grand Rapids, Mich.
Package Machinery Co., Springfield, Mass.
Pack-Rite Machines, Milwaukee, Wis.
Paper Converting Machine Co., Green Bay, Wis.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Redington, F. B. Co., Chicago, Ill.
Scandia Mfg. Co., N. Arlington, N. J.
Simplex Wrapping Machine Co., Oakland, Calif.
Stokes & Smith Co., Phila., Pa.
U. S. Automatic Box Machinery Co., Inc., Boston, Mass.
Wright's Automatic Machinery Co., Durham, N. C.

MARKING EQUIPMENT

Cushman & Denison Mfg. Co., New York, N. Y.
Dennison Manufacturing Co., Framingham, Mass.
Diagraph-Bradley Stencil Machine Corp., St. Louis, Mo.
Ferguson, J. L. Co., Joliet, Ill.
Floquil Products, Inc., New York, N. Y.
Force, Wm. A. & Co., Inc., Bklyn, N. Y.
Gottscho, Adolph Inc., New York, N. Y.
Markem, Machine Co., Keene, N. H.
Matthews, Jas. H. & Co., Pittsburgh, Pa.
Melind, Louis Co., Chicago, Ill.
Multistamp Co., Inc., The, Norfolk, Va.
Peerless Roll Leaf Co., Inc., Union City, N. J.
Superior Marking Equipment, Chicago, Ill.
Vertex Co., New York, N. Y.
Weber Addressing Machine Co., Chicago, Ill.

PRESSES, PRINTING

(Aniline)

Bagprint Machinery Corp., Royal Oak, Mich.
Chambon, L. Corp., New York, N. Y.
Cottrell, C. B. & Sons Co., Claybourn Div., Milwaukee, Wis.
Haida Engineering Co., Long Island City, N. Y.
Heinrich, H. H. Inc., New York, N. Y.
Henschel, C. B. Mfg. Co., Milwaukee, Wis.
Hess & Barker, Phila., Pa.
Hudson Sharp Machine Co., Green Bay, Wis.
Kidder Press Co., Inc., Dover, N. H.
Meisel Press Mfg. Co., Boston, Mass.
Paper Converting Machine Co., Green Bay, Wis.
Potdevin Machine Co., Bklyn, N. Y.
Rotogravure Engineering Co., New York, N. Y.
Rutherford Machinery Co., Div., Sun Chemical Corp., New York, N. Y.
Staude, E. G. Mfg. Co., St. Paul, Minn.
Unicrafts, Inc., Amherst, Mass.
Waldron, John Corp., New Brunswick, N. J.

PRESSES, PRINTING

(Letterpress)

Chambon, L. Corp., New York, N. Y.
Champlain Co., Inc., Bloomfield, N. J.
Cottrell, C. B. & Sons Co., Claybourn Div., Milwaukee, Wis.
Harris-Seybold Co., Cleveland, Ohio
Heinrich, H. H. Inc., New York, N. Y.
Hess & Barker, Phila., Pa.
Hooper, F. X. Co., Glenarm, Md.
Inman Mfg. Co., Inc., Amsterdam, N. Y.
Kidder Press Co., Inc., Dover, N. H.
Markem Machine Co., Keene, N. H.
Meisel Press Mfg. Co., Boston, Mass.
Miehle Printing Press Mfg. Co., Chicago, Ill.
Miller Printing Machinery Co., Pittsburgh, Pa.
Paper Converting Machine Co., Green Bay, Wis.
Potdevin Machine Co., Bklyn, N. Y.
Rotogravure Engineering Co., New York, N. Y.
Rutherford Machinery Co., Div., Sun Chemical Corp., New York, N. Y.
Staude, E. G. Mfg. Co., St. Paul, Minn.

PRESSES, PRINTING

(Lithographic)

Harris-Seybold Co., Cleveland, Ohio
Hess & Barker, Phila., Pa.
Hoe, R. & Co., Inc., New York, N. Y.
Miehle Printing Press Mfg. Co., Chicago, Ill.
Rotogravure Engineering Co., New York, N. Y.
Rutherford Machinery Co., Div., Sun Chemical Corp., New York, N. Y.
Webendorfer-Wills Co., Div. American Type Founders Sales Corp., Mt. Vernon, N. Y.

PRESSES, PRINTING

(Raised)

Chambon, L. Corp., New York, N. Y.
Hess & Barker, Phila., Pa.
Rotogravure Engineering Co., New York, N. Y.
Rutherford Machinery Co., Div., Sun Chemical Corp., New York, N. Y.

PRESSES, PRINTING

(Rotogravure)

Chambon, L. Corp., New York, N. Y.
Champlain Co., Inc., Bloomfield, N. J.
Cottrell, C. B. & Sons Co., Claybourn Div., Milwaukee, Wis.
Goss Printing Press Co., Chicago, Ill.
Harris-Seybold Co., Cleveland, Ohio
Heinrich, H. H. Inc., New York, N. Y.
Hess & Barker, Phila., Pa.
Hoe, R. & Co., New York, N. Y.
Kidder Press Co., Inc., Dover, N. H.
Meisel Press Mfg. Co., Boston, Mass.
Paper Converting Machine Co., Green Bay, Wis.
Rotogravure Engineering Co., New York, N. Y.
Standard Process Corp., Chicago, Ill.
Staude, E. G. Mfg. Co., St. Paul, Minn.
Unicrafts, Inc., Amherst, Mass.
Waldron, John Corp., New Brunswick, N. J.

SCALES, AUTOMATIC CHECK WEIGHERS

Arenco Machine Co., Inc., New York, N. Y.
Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Detecto Scales, Inc., Bklyn, N. Y.
Exact Weight Scale Co., The, Columbus, Ohio
Goat, Fred Co., Inc., The, Bklyn, N. Y.
Gump, B. F. Co., Chicago, Ill.
Howe Scale Co., The, Rutland, Vt.
Merrick Scale Mfg. Co., Passaic, N. J.
Toledo Scale Co., Toledo, Ohio
Triangle Package Machinery Co., Chicago, Ill.
Weigh Right Automatic Scale Co., Joliet, Ill.

SCALES, CONVEYOR

Detecto Scales, Inc., Bklyn, N. Y.
Exact Weight Scale Co., The, Columbus, Ohio
Howe Scale Co., The, Rutland, Vt.
Toledo Scale Co., Toledo, Ohio
Triangle Package Machinery Co., Chicago, Ill.
Weigh Right Automatic Scale Co., Joliet, Ill.

SCALES, FREIGHT, EXPRESS

(Computing)

Detecto Scales, Inc., Bklyn, N. Y.
Exact Weight Scale Co., The, Columbus, Ohio
Howe Scale Co., The, Rutland, Vt.
Toledo Scale Co., Toledo, Ohio

SCALES, OVER & UNDER WEIGHT

Detecto Scales, Inc., Bklyn, N. Y.
Exact Weight Scale Co., The, Columbus, Ohio
Howe Scale Co., The, Rutland, Vt.
Merrick Scale Mfg. Co., Passaic, N. J.
Thwing-Albert Instrument Co., Phila., Pa.
Toledo Scale Co., Toledo, Ohio

SCALES, WEIGHING & FILLING

Amsco Packaging Machinery Inc., Long Island City, N. Y.
Arenco Machine Co., Inc., New York, N. Y.
Automatic Scale Co., Inc., New York, N. Y.
Codie Kay, Los Angeles, Calif.
Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Detecto Scales, Inc., Bklyn, N. Y.
Exact Weight Scale Co., The, Columbus, Ohio
Ferguson, J. L. Co., Joliet, Ill.
Gump, B. F. Co., Chicago, Ill.
Howe Scale Co., The, Rutland, Vt.
Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Simplex Wrapping Machine Co., Oakland, Calif.
Stokes & Smith Co., Phila., Pa.
Toledo Scale Co., Toledo, Ohio
Triangle Package Machinery Co., Chicago, Ill.
U. S. Automatic Box Machinery Co., Inc., Boston, Mass.
Vol-U-Meter Co., The, Buffalo, N. Y.
Weigh Right Automatic Scale Co., Joliet, Ill.
Wright's Automatic Machinery Co., Durham, N. C.

SPRAYERS

Aeroil Burner Co., Inc., W. New York, N. J.
Bronzart Metals Co., New York, N. Y.
Federal Tool Corp., Chicago, Ill.
Scovill Mfg. Co., Waterbury, Conn.
Wilco Co., Los Angeles, Calif.

TANKS, HEATING & DIPPING

Aeroil Burner Co., W. New York, N. J.
Cooper, D. C. Co., Chicago, Ill.
Heil Engineering Co., Cleveland, Ohio
Sta-Warm Electric Co., Ravenna, Ohio
Youngstown-Miller Co., Belleville, N. J.

TESTING EQUIPMENT

General Electric Co., Schenectady, N. Y.
Hart Moisture Gauges, Inc., New York, N. Y.
Package Material Laboratories, Inc., Long Island City, N. Y.
Taber Instrument Corp., N. Tonawanda, N. Y.
Thwing-Albert Instrument Co., Phila., Pa.

Services Section

ASSOCIATIONS, TRADE & EDUCATIONAL

(Pertaining to Packaging)

Adhesive Manufacturers Assn. of America, New York, N. Y.
Advertising Federation of America, New York, N. Y.
Advertising Research Foundation, New York, N. Y.
Air Transport Assn. of America, Washington, D. C.
American Assn. of Advertising Agencies, New York, N. Y.
American Chemical Society, Washington, D. C.
American Drug Manufacturers Assn., Washington, D. C.
American Home Economics Assn., Washington, D. C.
American Inst. of Food Distribution, New York, N. Y.
American Management Assn., New York, N. Y.
American Marketing Assn., Bloomington, Ind.
American Meat Inst., Chicago, Ill.
American Paper & Pulp Assn., New York, N. Y.
American Society for Testing Materials, Phila., Pa.
American Spice Trade Assn., New York, N. Y.
American Standards Assn., New York, N. Y.
American Veneer Package Assn., Washington, D. C.
American Waxed Paper Assn., Phila., Pa.
Associated Cooperage Industries of America, St. Louis, Mo.
Associated Grocery Manufacturers of America, New York, N. Y.
Assn. of American Railroads, Freight Claim Div., Chicago, Ill.
Assn. of Canadian Advertisers, Toronto, Canada
Assn. of Food Distributors, New York, N. Y.
Assn. of National Advertisers, New York, N. Y.

XUM

Bristol Board Manufacturers Group (APPA), New York, N. Y.
California Co-operative Packaging Assn., Los Angeles, Calif.
Can Manufacturers Inst., New York, N. Y.
Canning Machinery & Supplies Assn., Battle Creek, Mich.
Cardboard Manufacturers Assn., New York, N. Y.
Coated & Processed Paper Assn., Providence, R. I.
Collapsible Tube Manufacturers Assn., New York, N. Y.
Container Manufacturers Guild, New York, N. Y.
Cooperative Food Distributors of America, Washington, D. C.
Cork Inst. of America, The, New York, N. Y.
Corrugated Box Distributors Assn., Inc., New York, N. Y.
Crown Manufacturers Assn. of America, Washington, D. C.
East Central Wooden Box Assn., Pittsburgh, Pa.
Eastern Lithographers Assn., New York, N. Y.
Eastern Wooden Box Assn., Boston, Mass.
Envelope Manufacturers Assn. of America, New York, N. Y.
Export Fibreboard Case Assn., San Francisco, Calif.
Fibre Board Manufacturers Assn., Boston, Mass.
Fibre Box Assn., Chicago, Ill.
Flexible Packaging Inst., New York, N. Y.
Folding Paper Box Assn. of America, Chicago, Ill.
Folding Paper Box Manufacturers Assn., New York, N. Y.
Frosted Foods Inst. of California, San Francisco, Calif.
Glass Container Mfrs. Inst., New York, N. Y.
Glassine & Greaseproof Paper Manufacturers Assn., New York, N. Y.
Gummed Industries Assn., New York, N. Y.
Industrial Packaging Engineers Assn. of America, Chicago, Ill.
Institute of Food Technologists, Geneva, N. Y.
Institute of Paper Chemistry, The, Appleton, Wis.
Kraft Paper Assn., Inc., New York, N. Y.
Label Manufacturers National Assn., Washington, D. C.
Lead Industries Assn., New York, N. Y.
Liquid Tight Paper Container Assn., Philadelphia, Pa.
Lithographers National Assn., Inc., New York, N. Y.
Lithographic Technical Foundation, Chicago, Ill.
Marking Device Assn., Chicago, Ill.
Milk Cap Statistical Bureau, Phila., Pa.
National Assn. of Display Industries, Chicago, Ill.
National Assn. of Food Chains, Washington, D. C.
National Assn. of Frozen Food Packers, Washington, D. C.
National Assn. of Glue Manufacturers, New York, N. Y.
National Assn. of Manufacturers, New York, N. Y.
National Assn. of Printing Ink Makers, New York, N. Y.
National Assn. of Sanitary Milk Bottle Closure Manufacturers, Phila., Pa.
National Canners Assn., Washington, D. C.
National Confectioners Assn., Chicago, Ill.
National Consumer-Retailer Council, New York, N. Y.
National Container Assn., Chicago, Ill.
National Dehydrators Assn., Chicago, Ill.
National Fibre Can & Tube Assn., New York, N. Y.
National Food Distributors' Assn., Chicago, Ill.
National Frozen Food Locker Assn., Streator, Ill.
National Industrial Advertisers Assn., Chicago, Ill.
National Meat Canners Assn., Chicago, Ill.
National Paint, Varnish & Lacquer Assn., Washington, D. C.
National Paperboard Assn., Chicago, Ill.
National Paper Box Manufacturers Assn., Phila., Pa.
National Paper Box Supplies Assn., Summit, N. J.
National Wholesale Druggists' Assn., New York, N. Y.
National Wooden Box Assn., Washington, D. C.
Northwest Canners Assn., Portland, Oregon
Northwestern Frozen Food Assn., Portland, Oregon
Pacific Coast Paper Box Manufacturers Assn., San Francisco, Calif.
Pacific Veneer Package Assn., Tacoma, Wash.
Packaging Institute, Inc., New York, N. Y.
Packaging Machinery Manufacturers Inst., Inc., New York, N. Y.
Paper & Bag Institute of the Pacific Coast, San Francisco, Calif.
Paper Bag Manufacturers Inst., New York, N. Y.
Paper Cup & Container Institute, New York, N. Y.
Paper Pail Assn., Chicago, Ill.
Paper Shipping Sack Manufacturers Assn., New York, N. Y.
Paraffined Carton Assn., Chicago, Ill.
Plastic Products Manufacturers Assn., New York, N. Y.
Plastics Materials Manufacturers Assn., Washington, D. C.
Plywood Package Inst., New York, N. Y.
Point of Purchase Advertising Inst., New York, N. Y.
Proprietary Assn., Washington, D. C.
Roll Leaf Manufacturers Assn., New York, N. Y.
Society of Designers for Industry, New York, N. Y.
Society of the Plastics Industry, New York, N. Y.
Southern Box & Crate Assn., Shreveport, La.
Steel Package Manufacturers Inst., Cleveland, Ohio
Technical Assn. of the Pulp & Paper Industry, New York, N. Y.
Textile Bag Manufacturers Assn., Chicago, Ill.
Textile Color Card Assn., New York, N. Y.
Toilet Goods Assn., New York, N. Y.
Tri-State Packers Assn., Easton, Md.
U. S. Trade Mark Assn., New York, N. Y.
Veneer Package Council, Washington, D. C.
Waxed Paper Institute, Rockford, Ill.
Wirebound Box Manufacturers Assn., Chicago, Ill.
Wooden Pail & Tub Assn., Keene, N. H.

CUSTOM PACKAGERS

Asco Packing Co., Newark, N. J.
Gesell, R. Inc., New York, N. Y.
House of Price, Inc., New York, N. Y.
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Tight Closure Co., Milwaukee, Wis.
Tilton & Cook Co., Leominster, Mass.
Titan Plastic Prods. Co., Los Angeles, Calif.
Toledo Plastics Co., Toledo, Ohio
Trenton Metals & Plastics Co., Trenton, N. J.
Tri-State Plastic Molding Co., Henderson, Ky.
Tupper Plastics, Farnumsville, Mass.
Uncas Mfg. Co., Providence, R. I.
Union Insulating Co., Parkersburg, W. Va.
United Comb & Novelty Co., Inc., Leominster, Mass.
Universal Button Fastening & Button Co., Detroit, Mich.
Universal Plastics Corp., New Brunswick, N. J.
Valley Plastics, Inc., Worcester, Mass.
Van Norman Molding Co., Chicago, Ill.
Victor Mfg. & Gasket Co., Chicago, Ill.
Victor Metal Products Corp., Bklyn, N. Y.
Victory Button Co., Inc., Leominster, Mass.
Victory Mfg. Co., Chicago, Ill.
Vichek Tool Co., The, Plastics Div., Cleveland, Ohio
Voges Mfg. Co., The, Ozone Park, L. I. N. Y.
Vulcanized Rubber Co., The, New York, N. Y.
Ward Plastic & Rubber Co., Rochester, N. Y.
Warren Plastics Corp., Warren, Pa.
Washington Molding Co., Inc., Port Washington, N. Y.
Waterbury Companies, Inc., Waterbury, Conn.
Watertown Mfg. Co., The, Watertown, Conn.
Western Plastics Moulding Co., Los Angeles, Calif.
Wheeling Stamping Co., Wheeling, W. Va.
White, S. S. Dental Mfg. Co., The, New York, N. Y.
Windman Bros., Los Angeles, Calif.
Wirz, A. H. Inc., Chester, Pa.
Wolford Plastic Molding Co., Los Angeles, Calif.
Worcester Moulded Plastics Co., Worcester, Mass.
Wright Plastics, Inc., New York, N. Y.
Yardley Plastics Co., Columbus, Ohio
Zenith Plastics, Inc., Cleveland, Ohio

PACKAGE DESIGN CONSULTANTS

(Independent Organizations)

California

Cruze, Charles Co., Los Angeles
Gindick, Franklin, Los Angeles
Pacific Designers, Los Angeles
Wheeler, Leon A., Los Angeles

Connecticut

Cheron, Pierre I., Stratford
Green, Frederick E., Westport
Hall, Frances Cushing, Wilton
Neubauer, Robert G. Inc., Southport
Post & Johnson, Inc., Hartford
Von Miklos, Josephine, New Canaan

District of Columbia

Sanders, Morris B., Washington

Georgia

Grau, Russell, Atlanta
Martin, Robert E. & Co., Atlanta

Illinois

Barnes & Reinecke, Chicago
Bielefield, Herbert Inc., Chicago
Carter, Joseph, Chicago
Chirpe, W. Rodney, Chicago
Farrel, Harry H., Chicago
Jackson, McStay, Co., Chicago
Jones, E. Willis, Chicago
Knoche, Lucille, Chicago
Koch, Karl Peter, Chicago
Kropp, Willis Ahlborn, River Forest
Lea-Tek Studio, Chicago
Macnair, C. S. & Associates, Chicago
Ressinger, Paul, Chicago
Spuehler, Ernst A., Chicago
Stensgaard, W. L., & Assocs., Inc., Chicago

Massachusetts

Baermann, Walter, Holyoke
Hollis, Morton, Boston
Kraber, G. R., Newtonville
Marsh, George, Boston

Michigan

Federico, Joseph B., New Baltimore
Swibold, Duane, Detroit

Minnesota

Darr, Harold W. Associates, Minneapolis

Missouri

Ditch, Ruth M., St. Louis
Gottschalk Design, University City

New Jersey

Chipman, Richmond Lane, Jr., Montclair
Petruccelli, Antonio, Mt. Tabor
Vassos, John, Camden

New York

Advance Industrial Designers, New York City
Allcolor Co., Inc., New York City
Arens, Egmont, New York City
Bach, Alfons, Associates, New York City
Bayer, Herbert, New York City
Bellisio, Bartolomeo, New York City
Bernhard, Lucian, New York City
Berni, Alan & Associates, New York City
Blumenthal, Margaret, New York City
Breen, Frederick Murray Inc., New York City
Clarke, Rene, New York City
Collura, Francesco, New York City
Colwell, Laurence J., New York City
D'Addario, Thomas, New York City
Davies, Helen & Associates, New York City
Davison, George, New York City
Dean, Charles S. C., New York City
DeNina, James Andrew, New York City
Deskey, Donald, New York City
Dohner & Lippincott, New York City
Dorland International Pettingell & Fenton, Inc., New York City
Dunne, Liam, New York City
Ferster, Reinhold Advertising, Buffalo
Freeman, Edna Leslie, New York City
Freeman, Nathaniel H., New York City
Gerth, Ruth, New York City
Gianninoto, Frank & Associates, New York City
Goldsborough, Francis F., New York City
Grover, Frederic S., Rochester
Gruen, Robert Associates, New York City
Hagopian, Vahan, New York City
Hamill, Virginia, New York City

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XUM

Harvey, Grace, New York City
Hodges, Guy W. Inc., New York City
Hornung, Clarence P., New York City
Humans, Maria, New York City
Jay, Norbert, New York City
Jensen, Gustav, New York City
Karasz, Ilonka, Brewster
Ketcham, Howard, New York City
Kogan, Belle, New York City
Koodin-Lapow Associates, New York City
Koppel, E. Leonard, New York City
Koster, Louis H., New York City
Lane, Jack, New York City
Lewis, Ben, New York City
Lippincott, J. Gordon & Co., New York City
Loewy, Raymond Associates, New York City
Lucas, Mildred C., New York City
Lux, Eugene, New York City
Markley, Margery, New York City
Martial & Scull, New York City
Maurer, Sascha A., New York City
Mayer, Fred A., New York City
Metzig, William, New York City
Murray & Scheiding, New York City
Nash, Ben, New York City
Nash, Jim, New York City
Nickelsen, John, Flushing, L. I.
Nielsen, Wm. R., New York City
O'Neil, Wm., New York City
Paige, Richard E., Inc., New York City
Park, Helen, New York City
Phenix Associates, New York City
Product, Industrial and Engineering Design Co., New York City
Rohde, Gilbert, New York City
Sakier, George, New York City
Schawinsky, Xanti, New York City
Schusterman, Wm. V., Bklyn
Sinel, Joseph, New York City
Spence-Rigolo, Inc., New York City
Steinweiss, Alex, New York City
Stengren, Jon, Forest Hills
Sutnar, Flint & Hall, New York City
Tarpey, Thomas, New York City
Timely Packaging Associates, New York City
Ullman, Martin, New York City
Van Doren, Nowland & Schladermundt, New York City
Welder, W. Archibald, New York City
Wilmet, Georges, New York City
Woodbury, C. O., New York City
Zweybruck, Emmy, New York City

Ohio

Designers for Industry, Inc., Cleveland
Mount, Charles A., Cincinnati
Rideout, John Gordon, Chagrin Falls

Pennsylvania

Croasdale & deAngelis, Inc., Upper Darby, Pa.
Kline, Leon M., York
Muller-Munk, Peter, Pittsburgh

Rhode Island

Alcott, John E., Providence

Wisconsin

Milwaukee Industrial Designers, Milwaukee

PRINTING ON GLASS, PLASTICS, etc.

Anigraphic Process, Inc., New York, N. Y.
Art Tube Co., Inc., Irvington, N. J.
Braun, W. Co., Chicago, Ill.
Buckley, C. E. Co., Leominster, Mass.
Cowles, Harold A. Box & Display Co., Rochester, N. Y.
Creative Printmakers Inc., New York, N. Y.
Croasdale & deAngelis, Inc., Upper Darby, Pa.
Cruver Mfg. Co., Chicago, Ill.
Decorated Containers Co., Hillside, N. J.
Emeloid Co., Inc., The, Arlington, N. J.
Fontaine Products Co., New York, N. Y.
Friedman Art, New York, N. Y.
Hayden, E. J. & Co., Inc., New York, N. Y.
Heidt Glass Works, Inc., Bklyn, N. Y.
Markem Machine Co., Keene, N. H.
Master Plastic Molding Corp., St. Louis, Mo.
McKay Co., Bklyn, N. Y.
Palm Bros. Decalcomania Co., The, Cincinnati, Ohio
Peerless Roll Leaf Co., Inc., Union City, N. J.
Post & Johnson, Inc., Hartford, Conn.
Printloid, Inc., New York, N. Y.
Process Displays, Inc., Milwaukee, Wis.
Sillcocks-Miller Co., The, S. Orange, N. J.
Transparent Specialties Corp., Cleveland, Ohio
Traver Corp., Chicago, Ill.

SAMPLE & PACKAGE DISTRIBUTION

Manufacturers Packaging Co., Newark, N. J.
Whaling Distributing Corp., New York, N. Y.

TRANSPARENT MATERIALS, CONVERTERS OF RIGID CELLULOSIC SHEET

Acme Paper Box Co., Chicago, Ill.
Alderman Paper Box Corp., Rochester, N. Y.
Allvue Container Corp., Bklyn, N. Y.
Apex Paper Box Corp., Chicago, Ill.
Arrow Mfg. Co., Inc., Hoboken, N. J.
Athol Paper Box Co., Athol, Mass.
Atlanta Box Factory, Atlanta, Ga.
Atlantic Paper Box Co., Boston, Mass.
Autokraft Box Co., Hanover, Pa.
Babcock Box Co., Attleboro, Mass.
Barger Box Co., Inc., Elkhart, Ind.
Benton Harbor Mfg. Co., Benton Harbor, Mich.
Bienfang Paper Co., New York, N. Y.
Bisler, G. A., Inc., Phila., Pa.
Blue River Plastics Mfg. Corp., New York, N. Y.
Box Novelties, Inc., New York, N. Y.
Box Shop, Inc., New Haven, Conn.
Bronzart Metals Co., New York, N. Y.
Buckley, C. E. Co., Leominster, Mass.
Buedingen, Wm. & Son, Rochester, N. Y.
Burt, F. N. Co., Inc., Buffalo, N. Y.
Cambridge Paper Box Co., Cambridge, Mass.
Casco Paper Box Co., Inc., Portland, Me.
Celloprint Inc., New York, N. Y.
Cellulose Packaging Corp., New York, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Clark, Geo. V. Co., Inc., Long Island City, N. Y.
Cleveland Plastics, Inc., Cleveland, Ohio
Clover Paper & Transparent Boxes, Inc., Long Island City, N. Y.
Cournand, E. L. Inc., New York, N. Y.
Craftsman Label Co., New York, N. Y.
Crook Paper Box Co., Kansas City, Mo.
Cruver Mfg. Co., Chicago, Ill.
Design Center, Inc., New York, N. Y.
Dickerman Box Co., Cambridge, Mass.
Dorfman, A. & Co., Inc., New York, N. Y.
Earlville Paper Box Co., Earlville, N. Y.
Eclipse Moulded Prod. Co., Milwaukee, Wis.
Eggerss-O'Flying Co., Omaha, Nebr.
Embee Transparent Specialty Co., New York, N. Y.
Emeloid Co., Inc., The, Arlington, N. J.
Everett Transparent Container Co., New York, N. Y.
Fairchild, E. E. Corp., Rochester, N. Y.
Fleishhacker Paper Box Co., San Francisco, Calif.
Flower City Specialty Co., Rochester, N. Y.
Forbes Lithograph Mfg. Co., Boston, Mass.
Friend Box Co., Danvers, Mass.
Frost Box Co., Inc., Pawtucket, R. I.
Globe Paper Box Co., Chicago, Ill.
Great American Plastics Co., Fitchburg, Mass.
Harvard Specialty Mfg. Corp., Cambridge, Mass.
Heminway Corp., Waterbury, Conn.
Henry, Ira L. Co., Watertown, Wis.
High Point Paper Box Co., High Point, N. C.
Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
Howell, F. M. & Co., Elmira, N. Y.
Hygienol Co., New York, N. Y.
Humitube Mfg. Co., Peoria, Ill.
J. L. Paper Box Co., Attleboro, Mass.
Kingman, E. B. Co., Leominster, Mass.
Landowne, J. Co., The, Bklyn, N. Y.
Loroco Industries, Inc., Reading, Ohio
Lorscheider-Schang Co., Rochester, N. Y.
Makdon Co., New York, N. Y.
Mankato Paper Box Co., Mankato, Minn.
Meier, Joshua Co., New York, N. Y.
Merrick Transparent Products, Long Island City, N. Y.
Meyer, Frank C. Co., Bklyn, N. Y.
Meyer, Jos. H. Bros., Bklyn, N. Y.
Miller, Walter P. Co., Inc., Phila., Pa.
Modern Boxes, Inc., Chicago, Ill.
Nashua Gummed & Coated Paper Co., Nashua, N. H.
National Metal Edge Box Co., Phila., Pa.
National Transparent Plastics Co., Springfield, Mass.
Neostyle, Inc., Chicago, Ill.
Nicoll & Co., San Francisco, Calif.
Paragon Plastics, Inc., Seattle, Wash.
Parfait Powder Puff Co., Chicago, Ill.
Paper Package Co., Indianapolis, Ind.
Pederson Mfg. Co., Los Angeles, Calif.
Plumly, Geo. W. Co., Phila., Pa.
Printloid, Inc., New York, N. Y.
Reynolds Spring Co., Molded Plastics Div., Cambridge, Ohio
Ritchie, W. C. & Co., Chicago, Ill.
Robinson, A. E. & Co., Chicago, Ill.
Schleicher, F. J. Paper Box Co., St. Louis, Mo.
Schulz, A. Geo. Co., Milwaukee, Wis.
Seaman Box Co., Inc., New York, N. Y.
Shaw Paper Box Co., Pawtucket, R. I.
Shaw-Randall Co., Pawtucket, R. I.
Siegel, A. L. Co., Inc., Newark, N. J.
Sillcocks-Miller Co., The, S. Orange, N. J.
Southern Plastics Co., Columbia, S. C.
Stecker Paper Box Co., Detroit, Mich.
Stein, A. & Co., Inc., Chicago, Ill.
Sterling Injection Molding, Inc., Buffalo, N. Y.
Taylor Box Co., Providence, R. I.
Tower Envelope Co., New York, N. Y.
Transparent Container Co., Kingston, N. Y.
Transparent Specialties Corp., Cleveland, Ohio
Union Specialty Co., Plainfield, N. J.
U. S. Envelope Co., Kellogg Div., Springfield, Mass.
U. S. Finishing & Mfg. Co., Chicago, Ill.
Universal Jewelry Case Co., Chicopee, Mass.
Wallace Paper Box Corp., New York, N. Y.
Warneke Paper Box Co., Denver, Colo.
Warner Bros. Co., The, Bridgeport, Conn.
Weinman Bros., Chicago, Ill.
Williams Bros., St. Joseph, Mich.
Young, Douglas Inc., Pawtucket, R. I.
Young, Everett F. Co., Providence, R. I.
Zumbiel, C. W. Co., Cincinnati, Ohio

TRANSPARENT MATERIALS, CONVERTERS OF TRANSPARENT FILM

American Products Mfg. Co., New Orleans, La.
Andrews, P. L. Corp., Bklyn, N. Y.
Arvey Corp., Chicago, Ill.

Atlantic Paper Box Co., Boston, Mass.
Bienfang Paper Co., New York, N. Y.
Brooks Paper Co., St. Louis, Mo.
Buckley, C. E. Co., Leominster, Mass.
Cello-Masters, Inc., New York, N. Y.
Celloprint, Inc., New York, N. Y.
Cellulose Packaging Corp., New York, N. Y.
Central States Paper & Bag Co., St. Louis, Mo.
Clarvan Corp., Milwaukee, Wis.
Colonial Envelope Co., New York, N. Y.
Comet Envelope & Paper Co., Inc., New York, N. Y.
Continental Bag Specialties Corp., New York, N. Y.
Converter Corp., Clinton, Mass.
Cowles, Harold A. Box & Display Co., Rochester, N. Y.
Crystal Transparent Corp., Inc., New York, N. Y.
Crystal Tube Corp., Chicago, Ill.
Cupples-Hesse Corp., St. Louis, Mo.
Daniels Mfg. Co., Rhinelander, Wis.
Dennison Mfg. Co., Framingham, Mass.
Diaphane Bag Corp. of Pa., Phila., Pa.
Dobeckmun Co., The, Cleveland, Ohio
Forbes Lithograph Mfg. Co., Boston, Mass.
General Felt Products, Div. Standard Cap & Seal Corp., Bklyn, N. Y.
General Laminating, Inc., Newark, N. J.
Humitube Mfg. Co., Peoria, Ill.
International Plastic Corp., Morristown, N. J.
Interstate Folding Box Co., The, Middletown, Ohio
Kehr Paper Products Co., Phila., Pa.
Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Mason Envelope Co., New York, N. Y.
McCoy Paper Converters, Phila., Pa.
Mehl Mfg. Co., Cincinnati, Ohio
Milprint, Inc., Milwaukee, Wis.
Modern Boxes, Inc., Chicago, Ill.
Modern Containers, Inc., Los Angeles, Calif.
Moist-R-Proof Container Co., San Francisco, Calif.
Mor-Gan Laminating & Foliating Co., New York, N. Y.
Munson Bag Co., The, Cleveland, Ohio
Nashua Gummed & Coated Paper Co., Nashua, N. H.
National Transparent Plastics Co., Springfield, Mass.
Neostyle Inc., Chicago, Ill.
Newark Paraffine & Parchment Paper Co., Newark, N. J.
Nicoll & Co., San Francisco, Calif.
Oneida Paper Prods., Inc., New York, N. Y.
Paragon Plastics, Inc., Seattle, Wash.
Paramount Paper Products Co., Inc., Phila., Pa.
Pie-Pak Co., Inc., Hoboken, N. J.
Plastics Finishing Corp., Bklyn, N. Y.
Pollock Paper & Box Co., Dallas, Texas
Print-A-Tube Co., Passaic, N. J.
Roto-Lith Ltd., New York, N. Y.
Royal Paper Corp., New York, N. Y.
Royal, Thomas M. & Co., Phila., Pa.
Shellmar Products Corp., Mt. Vernon, Ohio
Sillcocks-Miller Co., The, S. Orange, N. J.
Swan Metal Cap Co., Chicago, Ill.
Tower Envelope Co., New York, N. Y.
Transparent Specialties Corp., Cleveland, Ohio
Traver Corp., Chicago, Ill.
U. S. Envelope Co., Springfield, Mass.
Visking Corp., The, Chicago, Ill.
Western Products, Inc., Newark, Ohio
Western Waxed Paper Co., Los Angeles, Calif.

How to find your way around the PACKAGING FIELD

Month by Month

The above Directory is your Buyers' Guide of packaging. It leads you to the materials, methods, package parts and machinery you need.

But, the packaging field is a fast-changing field. Daily, new developments occur which affect packagers in all industries. Here, a new material is discovered for waterproofing shipping containers. There, it's a new type of closure for bottles. Someplace else, a new machine for speeding a key packaging operation is manufactured.

These basic changes, and their application to every field of industry in which packaging plays a major role from tools to toothbrushes, from perfumes to plasma, affect your business.

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MODERN PACKAGING MAGAZINE

122 East 42nd Street • New York 17, N. Y.

Addresses of companies listed appear on pages 1022–1033

XUM

Directory of Trade Names

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
A-B See	Automatic window bags	Oneida Paper Products, Inc. New York, N. Y.
ACL	Applied color lettering	Owens-Illinois Glass Co., Toledo, Ohio
A.C.M.	Boxboard, folding and display containers	American Coating Mills, Inc., Elkhart, Ind.
AMC	Cold water soluble ending gums	Stein, Hall & Co., Inc., New York, N. Y.
AMF Rack	Materials handling, storage, transporting unit	American Machine & Foundry Co., New York, N. Y.
Ace	Steel strapping tightener	Stanley Works, New Britain, Conn.
Acetate Face	Bag with acetate film front and glassine back	Mason Envelope Co., New York, N. Y.
Acetex	Printing material for plastics	Creative Printmakers Inc., New York, N. Y.
Ace-Tre	One-piece capsule metal tray	Ace Carton Corp., Cicero, Ill.
ACMA	Packet filling machines, prescription filling machines	Aurelio Tanzi Eng. Co., Bklyn, N. Y.
Acme	Stapling machinery and wire staples	Acme Staple Co., Camden, N. J.
Acme	Liquid fillers	U. S. Bottlers Machinery Co., Chicago, Ill.
Acme Steelstrap	Steelstrapping and equipment	Acme Steel Co., Chicago, Ill
Adamant	Printing inks	Sigmund Ullman Div. Sun Chemical Corp., Bronx, N. Y.
Addoweight	Automatic indicating, totalizing and counting scale	Merrick Scale Mfg. Co., Passaic, N. J.
Ad-Here	Decalcomania for jars and bottles	The Palm Bros. Decalcomania Co., Cincinnati, Ohio
AD-TY	Flat cotton tape, printed	General Printed String Co. Milwaukee, Wis.
Aeromatic	Automatic scales	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Agate Dipping	Chocolate coating paper	Matthias Paper Corp., Phila., Pa.
Aico	Composition, cold molded	American Insulator Corp., New Freedom, Pa.
Air-Flo	Bottle cleaning and filling machine	Karl Kiefer Machine Co., Cincinnati, Ohio
Airfoam	Sponge rubber	Goodyear Tire & Rubber Co., Akron ,Ohio
Air Insulated	Featherweight molded containers	Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Air Line	Jar cleaning machine	Karl Kiefer Machine Co., Cincinnati, Ohio
Air-O-Seal	Cellophane covered coffee bag	Thomas M. Royal & Co., Phila., Pa.
Ajax	Steel shipping containers	Sexton Can Co., Everett, Mass.
Ajax Glaze	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Alcoa	Aluminum products	Aluminum Co. of America, Pittsburgh, Pa.
Aldex	Filter paper	Aldine Paper Co., New York, N. Y.
Allison	Bag closing machine	B. F. Gump Co., Chicago, Ill.
All-Purpose	Metal caps for home canning	Anchor Hocking Glass Corp., Lancaster, Ohio
Allure	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
All-Weather	Weatherproofed displays for outdoor use	Badger Merchandising Displays, Inc., Milwaukee, Wis.
All-Weather	Rain-repellent kraft sheet	Bagpak, Inc., New York, N. Y.
Alpine Waxfold	Interfolded meat paper	Western Waxed Paper Co., Los Angeles, Calif.
Alseco	Seals or closures for glass containers	Aluminum Seal Co., New Kensington, Pa.
Alum-Cote	Aluminum metal coating	Watson-Standard Co., Pittsburgh, Pa.
Alumette	Aluminum coated paper	Kupfer Bros. Co., New York, N. Y.
Aluminite	Metallic-coated papers	Keller-Dorian Corp., New York, N. Y.
Aluminite Mezzotint	Metallic-coated printed paper	Keller-Dorian Corp., New York, N. Y.
Alvac	Vacuum tumbler closure	Aluminum Seal Co., New Kensington, Pa.
Amekine	Synthetic rubber dropper nipples	Pennsylvania Glass Products Co., Pittsburgh, Pa.
American Beauty	Box cover paper	C. R. Whiting Co., Inc., Hackensack, N. J.
American Prints	Fancy printed, patriotic	Louis Dejonge & Co., New York, N. Y.
Americase	Paper drinking cups	American Lace Paper Co., Milwaukee, Wis.
Amerine	Composition, cold molded	American Insulator Corp., New Freedom, Pa.
Amerisol	Coatings, protective resins, lacquer solutions	American Resinous Chemicals Corp., Peabody, Mass.
Amerite	Urea and phenolic resins	American Resinous Chemicals Corp , Peabody, Mass.
Ameroid	Casein	American Plastics Corp., New York, N. Y.
Amerseal	Lug caps, metal boxes	Anchor Hocking Glass Corp., Lancaster, Ohio
Amerseal	Pouring spout with screw cap closure	Continental Can Co., New York, N. Y.
Amkleer	Cellophane bags and envelopes	American Paper Goods Co., Kensington, Conn.
Ampaco	Paper mailing boxes	H. Fielsig, Inc., New York, N. Y.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Ampfil	Ampul filling machine	PerfeKtum Products Co., New York, N. Y.
Amphenol	General trade mark	American Phenolic Corp., Chicago, Ill.
Amphite	Amber flexible container	Hi-Land Products Co., Ossining, N. Y.
Amprinko	Printing inks	American Printing Ink Div., Sun Chemical Corp., Chicago, Ill.
Ampseal	Ampul sealing machine	PerfeKtum Products Co., New York, N. Y.
Ampwash	Ampul and vial washing machine	PerfeKtum Products Co., New York, N. Y.
Amscan	Can sealing compound	The Max Ams Machine Co., Bridgeport, Conn.
Amsco	Rotary high speed bag sealers	Amsco Packaging Machinery Inc., Long Island City, N. Y.
Amsco	Closing machine (double seamer)	The Max Ams Machine Co., Bridgeport, Conn.
Amseal	Can sealing compound	The Max Ams Machine Co., Bridgeport, Conn.
Amstar	Cork, metal and wood closures	American Star Cork Co., Inc., Bklyn, N. Y.
Amstex	Can sealing compound	The Max Ams Machine Co., Bridgeport, Conn.
Amyloid	Coated starch sheeting	American Products Mfg. Co., New Orleans, La.
Anchor	Metal and molded closures, sealing machines	Anchor Hocking Glass Corp., Lancaster, Ohio
Anchor	Steel strapping	Signode Steel Strapping Co., Chicago, Ill.
Anchorglass	Glass bottles, jars, jugs, tumblers	Anchor Hocking Glass Corp., Lancaster, Ohio
Androck	Wire display fixtures, floor and counter types	Washburn Co., Rockford, Ill.
Angel Glo Satin	High lustre satin	Taffel Bros., Inc., New York, N. Y.
Angle-Loc	Folding box for baked goods	The Ohio Boxboard Co., Wadsworth, Ohio
Anigraphic	Printing process on glass and plastics	Anigraphic Process, Inc., New York, N. Y.
Aniliner	Rotary aniline press	Kidder Press Co., Inc., Dover, N. H.
Anilink	Aniline ink, dye or pigmented type	Rotogravure Div., Sun Chemical Corp., New York, N. Y.
Anilink Kleensolve	Solvent, cleaning, for knurled rollers	Rotogravure Div., Sun Chemical Corp., New York, N. Y.
Anilox	Aniline inks	International Printing Ink and Finishes Divs., Interchemical Corp., New York, N. Y.
Anniversary	Halftone inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Anti-Work-Up	Non-work-up solution	Chemical Color & Supply Div., Sun Chemical Corp., Chicago, Ill.
Apaco	Folding cartons, corrugated shipping cases	Atlanta Paper Co., Atlanta, Ga.
Apex Inks	Marking inks	Adolph Gottscho, Inc., New York, N. Y.
Apex	Steel strapping	Signode Steel Strapping Co., Chicago, Ill.
Aqualeen	Transparent greaseproof papers	Newark Paraffine & Parchment Paper Co., Newark, N. J.
Aquapearl	Cast phenolic pearl shades	Catalin Corp., New York, N. Y.
Aqua-Seal	Moisture-resistant carton board	The Ohio Boxboard Co., Wadsworth, Ohio
Aquasette	Water repellent paper	Kupfer Bros. Co., New York, N. Y.
Aquasol	Stripping gum	Stein, Hall & Co., Inc., New York, N. Y.
Aquastop	Impregnated, coated waterproof liner fabric	Protective Coatings Corp., Belleville, N. J.
Aquatex	Waterproof closure for multiwall paper bags	Bemis Bro. Bag Co., St. Louis, Mo.
Aquatite	Resinous adhesive	National Adhesives, New York, N. Y.
Arabol	Adhesive	Arabol Mfg. Co., New York, N. Y.
Araflex	Adhesive	Arabol Mfg. Co., New York, N. Y.
Aratex	Adhesive	Arabol Mfg. Co., New York, N. Y.
Arctic-Wrap	Bleached kraft paper	Yorkville Paper Co., Inc., New York, N. Y.
Arenco	Automatic packaging machines	Arenco Machine Co., Inc., New York, N. Y.
Argent Silver Print	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Argette	Box paper	Kupfer Bros. Co., New York, N. Y.
Aristo	Confectionery bags	American Paper Goods Co., Kensington, Conn.
Aristocrat	Folding paper boxes	Edwin J. Schoettle Co., Phila., Pa.
Aristocrat	Wax-lined food tray	Sutherland Paper Co., Kalamazoo, Mich.
Aristokraft	Cellophane garment bags	Central States Paper & Bag Co., St. Louis, Mo.
Aristowax	Paraffin wax	Petroleum Specialties, Inc., New York, N. Y.

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Arksafe	Crinkled kraft linings for bags, barrels, drums and boxes. Crinkled paper in rolls and sheets	Arkell Safety Bag Co., New York, N. Y.
Armalloy	Collapsible tube metal	New England Collapsible Tube Co., Chicago, Ill.
Armorply	Metal-covered plywood	U. S. Plywood Corp., New York, N. Y.
Amrus	Plastic containers	National Transparent Plastics Co., Springfield, Mass.
Arrowhead	Inks and varnishes	Howard Flint Ink Co., Detroit, Mich.
Artboxtone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Artcote	Pyroxylin metallic coated papers	Artcote Papers, Inc., Irvington, N. J.
Art-Craft	Fancy embossed paper	Springfield Coated Paper Corp., Camden, N. J.
Artex	Leather substitute paper	Bradner Smith & Co., Chicago, Ill.
Art Finished Pastels	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Art Floral	Brightwood kid finish papers	Holyoke Card & Paper Co., Springfield, Mass.
Art Gingham	Brightwood kid finish papers	Holyoke Card & Paper Co., Springfield, Mass.
Artillery	Box cover	District of Columbia Paper Mills, Inc., Washington, D. C.
Artmold	Molded plastic caps	Armstrong Cork Co., Lancaster, Pa.
Art Pastels	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Art Pockets	Folders with eyelet and long fasteners	Henry Schmidt & Bro., Inc., Phila., Pa.
Asphaltite	Board impregnated with odorless asphaltum	National Container Corp., Long Island City, N. Y.
Astex	Waterproofing, wrapping paper	E. W. Twitchell, Inc., Pkg. Div., Phila., Pa.
Ateco	Packet and prescription filling machines	Aurelio Tanzi Eng. Co., Bklyn, N. Y.
Athos	Cover paper	United Mfg. Co., Springfield, Mass.
Atlasol	Adhesives	Atlas Gum & Sizing Co., New York, N. Y.
Atlasta	Paper food containers	Stevens & Thompson Paper Co., Greenwich, N. Y.
Auger-Vac	Filling equipment	Stokes & Smith Co., Frankford, Phila., Pa.
Aulcoid	Quick-drying finish for metal and wood	Ault & Wiborg, Div. Interchemical Corp., New York, N. Y.
Aulflex	Flexible synthetic resin finish	Ault & Wiborg, Div. Interchemical Corp., New York, N. Y.
Aulspar	Water-resistant spar varnish	Ault & Wiborg, Div. Interchemical Corp., New York, N. Y.
Aultite	Protective drum lining	International Printing Ink and Finishes Divs., Interchemical Corp., New York, N. Y.
Aultone	Pyroxylin lacquer for air-dried metal finishing	Ault & Wiborg, Div. Interchemical Corp., New York N. Y.
Autobac	Measuring device	Wright's Automatic Machinery Co., Durham, N. C.
Autoclench	Stapler	Bostitch, Inc., East Greenwich, R. I.
Autofoil	Roll leaf	Coughlin Mfg. Co., New York, N. Y.
Autokrat	Collapsible paper boxes	Edwin J. Schoettle Co., Phila., Pa.
Auto-Pac	Automatic folding glued cartons	Gordon Cartons, Inc., Baltimore, Md.
B.D.	Kraft papers	Bulkley, Dunton & Co., New York, N. Y.
B-M Wrap	Moistureproof wrapping	Plastic Coating Corp., Holyoke, Mass.
"B" Brand	Tin cans and closing machines	National Can Corp., New York, N. Y.
Babytone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Bacon Pak	Greaserpoof wrappers	Daniels Mfg. Co., Rhinelander, Wis.
Bagpak	Multi-wall paper bag filling and closing equipment	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Bag-Packer	Multiwall bag filling & closing machines	International Paper Products Div., International Paper Co., New York, N. Y.
Bagpakers	Bag filling and closing machinery	Bagpak, Inc., New York, N. Y
Bakelite	Plastics and resins	Bakelite Corp., New York, N. Y.
Baktak	Envelope back seam gum	Stein, Hall & Co., Inc., New York, N. Y.
Ballyhoo	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Bandbox Stripes	Printed papers, fancy	Louis Dejonge & Co., New York, N. Y.
Bar-Grain	Crimped cotton gift ribbon	General Printed String Co., Milwaukee, Wis.
Barkstone	Imitation cork box covers	District of Columbia Paper Mills, Inc., Washington, D. C.
Bar-Nun	Bag feeders, openers, weighers and closers	B. F. Gump Co., Chicago, Ill.
Bar-Nun Auto Check	Automatic net weighers	B. F. Gump Co., Chicago, Ill.
Barque	Print box paper	The Marvellum Co., Holyoke, Mass.
Barr-Kap	Bar use caps	Aluminum Seal Co., New Kensington, Pa.
Barroll Nozzle	Can pouring spout	The Aridor Co., Chicago, Ill.
Barroll Nozzle	Special nozzle with screw closure	Continental Can Co., New York, N. Y.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Bas Relief	Gold and silver topped embossed paper	Hampden Glazed Paper & Card Co., Holyoke, Mass.
Battle Creek	Wrapping machines and packaging machines	Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich.
Battleship	Flour bag packer	Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Bayru	High strength fibreboard	Rogers Corp., Manchester, Conn.
Beacon	Inturned lug caps	Anchor Hocking Glass Corp., Lancaster, Ohio
Beau Tye	Cotton ribbon	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Beauwood	Decorative paper	Hazen Paper Co., Holyoke, Mass.
Bedford Cord	Embossed mica paper	Hazen Paper Co. Holyoke, Mass.
Bee-line	Automatic labeler	Economic Machinery Co., Worcester, Mass.
Beetle	Urea-formaldehyde molding compound	American Cyanamid Co., Plastics Div., New York, N. Y.
Bells and Stars	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Bemis A	Cotton seamless bag	Bemis Bros. Bag Co., St. Louis, Mo.
Bemis Special	Bag closing thread	Bemis Bros. Bag Co., St. Louis, Mo.
Bendall	Attachment for steel rule bender	J. F. Helmold & Bro., Inc., Chicago, Ill.
Bend-N-Rap	Flexible corrugated for wrapping	Ajax Box Co., Chicago, Ill.
Bendovers	Foil tags, wire reinforced for small packages	A. Kimball Co., New York, N. Y.
Ben Mont	Gift wrappings, tissues, glassine bags, shredded waxed papers	Ben Mont Papers, Inc., Bennington, Vt.
Bergmann	Ice cream fillers	Horix Mfg. Co., Pittsburgh, Pa.
Be Square	Micro-crystalline coating wax	Bareco Oil Co., Tulsa, Okla.
Bethcolite	Tin plate	Bethlehem Steel Co., Bethlehem, Pa.
Betterbilt	Set-up paper boxes	Thoma Paper Box, Inc., Buffalo, N. Y.
Better-Pac	Sealing tape machine	Better Packages, Inc., Shelton, Conn.
Big Chief	Glass bottles	Owens-Illinois Glass Co., Toledo, Ohio
Big Inch	Measuring dispenser for pressure sensitive tape	Better Packages Inc., Shelton, Conn.
Birch	Box cover	District of Columbia Paper Mills, Inc., Washington, D. C.
Birchette	Box paper	Kupfer Bros. Co., New York, N. Y.
Blackbird Embossed	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Blackol	Varnished paper liner	General Felt Products, Div. Standard Cap & Seal Corp., Bklyn, N. Y.
Blacktone	Printing inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Blanchette	Box paper	Kupfer Bros. Co., New York, N. Y.
Bliss	Carton stichers	Bostitch, Inc., East Greenwich, R. I.
Bliss	Wire stitchers	Dexter Folder Co., New York. N. Y.
Bliss	Solid fibre shipping containers	Robert Gair Co., Inc., New York, N. Y.
Block Board	Heavy pressed board signs	Chaspec Mfg. Co., New York, N. Y.
Blossomtime	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Blue Bird	Paper labels	Wheeler-Van Label Co., Grand Rapids, Mich.
Blu-Kor	Gummed cloth tape	The Gummed Products Co., Troy, Ohio
Blum	Testing machines	The LaBoiteaux Co., Inc., Cincinnati, Ohio.
Blum-O-Matic	One and two piece cartons	Blum Folding Paper Box Co., Inc., Bklyn, N. Y.
Bond	Powder filling machines	U. S. Automatic Box Machinery Co., Inc., Roslindale, Boston, Mass.
Bondcor	Corrugated box adhesive	Stein, Hall & Co., Inc., New York, N. Y.
Bond-Crowns	Crowns for beverage bottles and cans	Bond Mfg. Corp., Inc., Wilmington, Del.
Bonnlinn	Fibrous material	Chicopee Mills, New York, N. Y.
Boosters	Portable belt conveyors	The Rapids-Standard Co., Inc., Grand Rapids, Mich.
Bo-Seals	Pre-tied, cellulose bows	Stark Bros. Ribbon Corp., New York, N. Y.
Bostitch	Wire staples, staplers, stitchers, tackers and stitching wire	Bostitch, Inc., East Greenwich, R. I.
Boston	Wire stitchers	Bostitch, Inc., East Greenwich, R. I.
Boston	Wire stitchers	Dexter Folder Co., New York, N. Y.
Bouquet	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Boxcrafters	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Box Veneer	Wood grain box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Brad-Tite	Specialty wrappers for bread and food	Dixie Wax Paper Co., Dallas, Texas
Brazilian Bright	Nature papers	Bradner Smith & Co., Chicago, Ill.
Bright Spots	Fancy paper	Louis Dejonge & Co., New York, N. Y.

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Brighten Leaf	Roll leaf	Griffin, Campbell, Hayes, Walsh, Inc., New York, N.Y.
Brightwood	Leatherette; suede; fancy papers	Holyoke Card & Paper Co., Springfield, Mass.
Brightwood	Folding box glue	Stein, Hall & Co., Inc., New York, N. Y.
Brightwood	Paper box making machine	U. S. Automatic Box Machinery Co., Inc., Roslindale, Boston, Mass.
Brightwood Cameo	Box cover paper	Holyoke Card & Paper Co., Springfield, Mass.
Brightwood Polychrome	Box cover paper	Holyoke Card & Paper Co., Springfield, Mass.
Brightwood Sateens	Box cover paper	Holyoke Card & Paper Co., Springfield Mass.
Brilliant Metallics	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Britecote	Paper stock	Brooks Bank Note Co., Springfield, Mass.
Broadside	Folding carton	Robert Gair Co., Inc., New York, N. Y.
Brocade	Printed embossed paper	Hampden Glazed Paper and Card Co., Holyoke, Mass.
Brocart Prints	Metallic printed and embossed box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Broken Back	Patented display container	Brooks Bank Note Co., Springfield, Mass.
Bronzart	Counter and window display and point of sale material	Bronzart Metals Co., New York, N. Y.
Bronzoid	Embossed signs	Chaspec Mfg. Co., New York., N. Y.
Brooks Twin	Double unit display container	Brooks Bank Note Co., Springfield, Mass.
Brownie	Beer bottle (non-returnable)	Brockway Glass Co., Inc., Brockway, Pa.
Brownskin	Impregnated waterproof wrapper	Angier Corp., Framingham, Mass.
Brownskin Tarpaulins	Covers for outdoor storage	Angier Corp., Framingham, Mass.
Brownskin Vaporseal	Waterproof, vapor-resisting tape	Angier Corp., Framingham, Mass.
Bruno	Semi-automatic can filling machine	The Vol-U-Meter Co., Buffalo, N. Y.
Brunswick Homespuns	Paper for box coverings	Pejepscot Paper Co., New York, N. Y.
Buckskin	Kraft lined boxes	Morris Paper Mills, Chicago, Ill.
Bufferrap	Waterproof cushion wrapping	Central Paper Co., Inc., Muskegon, Mich.
Bulkan	Paper can for bulk ice cream	The Sealright Co., Inc., Fulton, N. Y.
Bulkbinding	Steel strapping	Signode Steel Strapping Co., Chicago, Ill.
Bulk-Flo	Elevator-conveyor-feeder	Link Belt Co., Chicago, Ill.
Burgess	Hand, foot and motor driven staplers	The Burgess Fastening Co., Cleveland, Ohio.
Burlabox	Export water-resistant containers	National Container Corp., Long Island City, N. Y.
Butan	Latex impregnated leatherette	Bradner Smith & Co., Chicago, Ill.
Butacite	Polyvinyl butyral resin	E. I. du Pont de Nemours & Co. Inc., Wilmington, Del.
CCS	Beverage and beer crowns	Crown Cork & Seal Co., Inc., Baltimore, Md.
CF	Cotton flock papers, velour type	Keller-Dorian Corp., New York, N. Y.
C.M.C.	Packaging and cartoning machinery	U. S. Automatic Box Machinery Co., Inc., Boston, Mass.
CPV	Phenolic resin varnishes	Chemical Plastics, Inc., Minneapolis, Minn.
CRCO	Labeling and casing equipment	Chisolm-Ryder Co. of Pa., Hanover, Pa.
CT	Continuous thread screw caps	Phoenix Metal Cap Co., Chicago, Ill.
Cakepak	Greaseproof labels and inserts for cakes	Tompkins' Label Service, Phila., Pa.
Calkraft mailers	Mailing cartons	Calumet Carton Co., Harvey, Ill.
Camachines	Slitting and roll winding machines	Cameron Machine Co., Bklyn, N. Y.
Cambric	Two tone, flat back embossed box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Camel Brand	Corrugated containers	The Ashtabula Corrugated Box Co., Ashtabula, Ohio
Cameo-Cut	Cut out letters, ornament signatures	Cameo Die & Label Co., New York, N. Y.
Cameoflex	Iridescent label printing process	Cameo Die & Label Co., New York, N. Y.
Cameo-Shine	Aluminum foil substitute	Cameo Die & Label Co., New York, N. Y.
Cameron	Can making machinery	Cameron Can Machinery Co., Chicago, Ill.
Camlet	Two-tone embossed paper	Springfield Coated Paper Corp., Camden, N. J.
Campac	Pouring sifter, round box closure	Cambridge Paper Box Co., Cambridge, Mass.
Canco	Metal and fibre containers	American Can Co., New York, N. Y.
Candy Pak	Greaseproof labels and inserts for candies	Tompkins' Label Service, Phila., Pa.
Candy Stripes	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Canisco	Fibre board	Canister Co., Inc., Phillipsburg, N. J.
Canno	Belt conveyor	Karl Kiefer Machine Co., Cincinnati, Ohio
Canvas	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Canvelope	Flexible, heat-sealable foil bags and tubes	Kehr Paper Products Co., Phila., Pa.
CaPeM	Automatic screw capping machines	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Capico	Printing inks	Capitol Printing Ink Co., Inc., Washington, D. C.
Capseal	Coated paper cap liners	Irvington Varnish & Insulator Co., Irvington, N. J.
Captive Cap	Collapsible tube	National Collapsible Tube Co. Providence, R. I.
Capvent	Venting closure	Ferdinand Gutmann & Co., Bklyn, N. Y.
Carbofilm	Coated wood gum sheeting	American Products Mfg. Co. New Orleans, La.
Cardolite	Resins	Irvington Varnish & Insulator Co., Irvington, N. J.
Carnival	Embossed foil box papers	Hazen Paper Co., Holyoke, Mass.
Carpac	Reinforced gummed tape	Atlantic Gummed Paper Corp., Bklyn, N. Y.
Carpenter	Fibre drums	Carpenter Container Co., Inc., Bklyn, N. Y.
Carry-Safe	Egg carton	Self-Locking Carton Co., Chicago, Ill.
Carter Vac	Vacuum powder fillers	Carter Eng. Co., Danville, Ill.
Cart-N-Seal	Carton sealing adhesives	Stein, Hall & Co., Inc., New York, N. Y.
Caseal	Closure	Owens-Illinois Glass Co., Toledo, Ohio
Casepak	Waterproof kraft-laminated case liners	Clarvan Corp., Milwaukee, Wis.
Catabond	Phenolic resin adhesive	Catalin Corp., New York, N.Y.
Catalin	Cast phenolic resin	Catalin Corp., New York, N.Y.
Catapak	Phenolic molding compound	Catalin Corp., New York, N.Y.
Catavar	Phenolic resin adhesive	Catalin Corp., New York, N.Y.
Ceco	Carton folding, closing and glue sealing machines	Container Equipment Corp., Newark, N. J.
Cedar	Woodgrain box papers	Hazen Paper Co., Holyoke, Mass.
Ceglin	Cellulose finishes for textiles	Sylvania Industrial Corp., New York, N. Y.
Celate	Opaque, transparent, and translucent cellulose acetate in colors.	E. L. Cournand, Inc., New York, N. Y.
Cello-Bond	Cellophane cement	Paisley Products, Inc., Chicago, Ill.
Cello-Face	Bag with cellophane front and glassine back	Mason Envelope Co., New York, N. Y.
Cellophane	Transparent cellulose sheeting	E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Cellophane	Transparent cellulose sheeting	Sylvania Industrial Corp., New York, N. Y.
Celloprinter	Cellophane printing machine	Kidder Press Co., Inc., Dover, N. H.
Cello-Safe	Cellophane lollypop sticks	Fibre Cord Co., New York, N. Y.
Cellosheen	Super-transparent glassine	Deerfield Glassine Co., Monroe Bridge, Mass.
Cello Tape	Pressure sensitive transparent tape	Freyberg Bros.-Strauss, Inc. New York, N. Y.
Cell-U-Art	For packaging men's underwear, lingerie, candy, etc.	Traver Corp., Chicago, Ill.
Cellucolor	Letterpress printing method	Shellmar Products Corp., Mt. Vernon, Ohio
Cellu-Gums	Adhesives for gluing transparent sheeting	National Adhesives, New York, N. Y.
Cellulin	Aniline printing method	Shellmar Products Corp., Mt. Vernon, Ohio
Celluloid	Cellulose nitrate base; sheets, rods, tubes, rolls	Celanese Plastics Corp., New York, N. Y.
Celluplastic	Sheet-formed acetate vials and tubes	Celluplastic Corp., Newark, N. J.
Cell-U-Print	Varnished bags	Thomas M. Royal & Co., Phila., Pa.
Cellusuede	Flock paper	Stevens, Nelson Paper Corp., New York, N. Y.
Cellusuede	Velour paper	Cellusuede Products, Inc., Rockford, Ill.
Cellutin	Grease resistant paper	The Cellutin Corp., Holyoke, Mass.
Celolustre	Box coating	National Metal Edge Box Co., Phila., Pa.
Celonite	Cellulose nitrate plastic sheeting	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Celons	Cellulose caps and bands	The Celon Co., Madison, Wis.
Cel-O-Seal	Cellulose caps and bands	Armstrong Cork Co., Lancaster, Pa.
Cel-O-Seal	Caps and bands	E. I. du Pont de Nemours & Co. Inc., Wilmington, Del.
Celoshine	Waxed glassine bags with window	Dixie Wax Paper Co., Inc., Dallas, Texas
Celowax	Waxed sulphite	Riegel Paper Corp., New York, N. Y.
Cel-Spar	Box cover papers	Paper City Mfg. Co., Inc., Holyoke, Mass.
Cem	Filling and capping machines	Crown Cork & Seal Co., Baltimore, Md.
Cemac	Milk bottle capping machine	Crown Cork & Seal Co., Baltimore, Md
Cemco	Beer filling and capping machines	Crown Cork & Seal Co., Baltimore, Md.
Centraline	Line of paper products	Central Paper Co., Inc., Muskegon, Mich.
Century	Carton gluer	E. G. Staude Mfg. Co., St. Paul, Minn.
Cerex	High heat-resistant thermoplastic	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Challenge	Inks and marking equipment	Louis Melind Co., Chicago, Ill.
Challenger	Cellulose window gluing machine	E. G. Staude Mfg. Co., St. Paul, Minn.
Challis Print	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Chambon	Typographic printing presses	Champlain Co., Inc., New York, N. Y.
Chameleon	Leatherette paper	Springfield Coated Paper Corp., Camden, N. J.

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Chami-Pack	Cigaret and tobacco paper mounted	H. P. Smith Paper Co., Chicago Ill.
Champion	Rubber type holder	Jas. H. Matthews & Co., Pittsburgh, Pa.
Champion	Envelope making machine	F. L. Smithe Machine Co., Inc., New York, N. Y.
Champion	Adjustable shell making machine	E. G. Staude Mfg. Co., St. Paul, Minn.
Champlain	Roll fed rotogravure printing equipment	Champlain Co., Inc., New York, N. Y.
Chase Test	Heavy duty cotton bags	Chase Bag Co., Chicago, Ill.
Chastik	Adhesive backing	Chaspec Mfg. Co., Inc., New York, N. Y.
Chatoye	Pyroxylin treated box papers	Plastic Coating Corp., Holyoke, Mass.
Check-Weigher	Automatic check-weighing scale	Merrick Scale Mfg. Co., Passaic, N. J.
Cheerio	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Chemaco	Thermoplastic molding granules	Chemaco Corp., Berkeley Heights, N. J.
Chemco	Wax and fast-setting inks	Chemical Color & Supply Div., Sun Chemical Corp., Chicago, Ill.
Chest Craft	Anti-tarnish silverware chests	Leominster Paper Box Co., Leominster, Mass.
Cheviot	Paper box covering	Pejepscot Paper Co., New York, N. Y.
Chevlot	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Chevron Print	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Chick Pullman	Corrugated chick shipping containers	Inland Container Corp., Indianapolis, Ind.
Chilton Process	Metal inlaying in plastics	Plastic Inlays, Inc., Summit, N. J.
Chlorea	Heat seal coatings	Flood & Conklin Mfg. Co., Newark, N. J.
Christmas Candle	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Christmas Ribbons	Fancy printed paper	Louis Dejonge & Co., New York, N. Y.
Cinati	Liquid bottling machine	Karl Kiefer Machine Co., Cincinnati Ohio
Cinati Junior	Liquid bottling machine	Karl Kiefer Machine Co., Cincinnati, Ohio
Cin-Made	Fibre cans	The Cin-Made Corp., Cincinnati, Ohio
Circle "A"	Molded and metal caps, corks and glass containers	Armstrong Cork Co., Lancaster, Pa.
Citrustrap	Steel strapping	Acme Steel Co., Chicago, Ill.
Clarbond	Case sealing glue	Clark Stek-O Corp., Rochester, N. Y.
Clargum	Bottle labeling glue	Clark Stek-O Corp., Rochester, N. Y.
Clarkseal	Liquid glue for sealing cases	Clark Stek-O Corp., Rochester, N. Y.
Clarophane	Window bags	Continental Bag Specialties Corp., New York, N. Y.
Clarophane	Window bags	Oneida Paper Products, Inc., New York, N. Y.
Clarpak	Waterproof kraft-laminated covers	Clarvan Corp., Milwaukee Wis.
Clarpic	Pick-up glue for labeling cans	Clark Stek-O Corp., Rochester, N. Y.
Clarseal	Shipping case sealing glue	Clark Stek-O Corp., Rochester, N. Y.
Clartab	Ready mixed adhesive for general purposes	Clark Stek-O Corp., Rochester, N. Y.
Clartac	Carton sealing glue	Clark Stek-O Corp., Rochester, N. Y.
Clean-Glaze	White machine-glazed paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Clearit	Asbestos	Scientific Filter Co., New York, N. Y.
Clearseal	Coating for fabrics and paper	Cleaveland Lab. & Mfg. Co., Inc., Peapack, N. J.
Clearseal	Thermoplastic coated acetate	General Laminating, Inc., New York, N. Y.
Clearseal	Heat sealing glassine	Hartford City Paper Co., Hartford City, Ind.
Cleanite	Cellulose acetate containers	Celluplastic Corp., Newark, N. J.
Clearview	Cellophane bags	Equitable Paper Bag Co., Inc., Long Island City, N. Y.
Clear-Vu-Mason	Home canning mason jars	Brockway Glass Co., Inc., Brockway, Pa.
Cleveco	Lined fibre can	Cleveland Container Co., Cleveland, Ohio
Click-Top	Hinged cover box	National Folding Box Co., New Haven, Conn.
Climax	Bottle wrappers	The Hinde & Dauch Paper Co., Sandusky, Ohio
Clipper	Cellophane bag making machine	Modern Containers Co., Los Angeles, Calif.
Clipper Made	Cellophane bags	Modern Containers Co., Los Angeles, Calif.
Cloud	Paper box covering	Pejepscot Paper Co., New York, N. Y.
Clover Leaf	Protective coatings	Clover Leaf Paint & Varnish Corp., Long Island City, N. Y.
Cloz-it	Hand stapling machine for closing plywood drums	Seymour & Peck Co., Chicago, Ill.
Coach and Four	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Coated Lithwite	Coated boxboard	The Gardner-Richardson Co., Middletown, Ohio
Code-O-Matic	Machine for code or control number printing	New Jersey Machine Corp., Hoboken, N. J.
Coilwrap	Spiral wrapping	Angier Corp., Framingham, Mass.
Coldflex	Cold flexible glue	Arvey Corp., Chicago, Ill.
Cold-Tempered	Printing plate rubber	Louis Melind Co., Chicago, Ill.
Collofilm	Adhesive	Stein, Hall & Co., Inc., New York, N. Y.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Colodense	Gravure printing method	Shellmar Products Corp., Mt. Vernon, Ohio
Colonial	Paper cups	Boston Drinking Cup Co., Dedham, Mass.
Colorado Red	Printing inks	Geo. H. Morrill Div., Sun Chemical Corp., New York, N. Y.
Colorama	Pyroxylin coated metallic papers in brilliant colors	Hazen Paper Co., Holyoke, Mass.
Colorettes	Printed cellophane flower pot wrappers	The Dobeckmun Co., Cleveland, Ohio
Colorfilm	Cellulose laminated coated paper	The Dobeckmun Co., Cleveland, Ohio
Colorgraphic	Transparent signs and calendars	The U. S. Printing & Litho Co., Cincinnati, Ohio
Coloroid	Applied color to bottles and jars	Double Duty Products, Inc., Cleveland, Ohio
Color-Pak	Colored shipping containers and floor displays	The U. S. Corrugated-Fiber Box Co., Indianapolis, Ind.
Colorstitch	Colored stapling and stitching wire	Acme Steel Co., Chicago, Ill.
Colorvar	Colored overprint varnish	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Col-O-Tex	Coated fabrics and artificial leather	Columbus Coated Fabrics Corp., Columbus, Ohio
Colr-Tye	Cotton ribbons and ties	Fibre Cord Co., New York, N. Y.
Colt Air	Insulated containers	Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Coltjems	Semi-precious stones (plastics)	Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Coltrock	Phenolic	Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Coltwood	High impact phenolic	Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia	Hand numbering machines	Wm. A. Force, & Co., Inc., Bklyn, N. Y.
Columbus	Overweight - underweight scales	The Exact Weight Scale Co., Columbus, Ohio
Comet	Sealing tapes, box stays	McLaurin-Jones Co., Brookfield, Mass.
Comet	Out-folding carton gluer	E. G. Staude Mfg. Co., St. Paul, Minn.
Commander	Case opener positioning machine	J. L. Ferguson Co., Joliet, Ill.
Commando	Protective paper	Louis Dejonge & Co., New York, N. Y.
Common Sense	Jars and bottles	Owens-Illinois Glass Co., Toledo, Ohio
Complete Satintone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Complimentary Print	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Computagram	Computing scale	Toledo Scale Co., Toledo, Ohio
Concora	Boxboard cartons and containers	Container Corp. of America, Chicago, Ill.
Congo	Casein metallic box papers	Hazen Paper Co., Holyoke, Mass.
Conneaut	General line cans	The Conneaut Can Co., Conneaut, Ohio
Conomee	Box cover paper	Matthias Paper Corp., Phila., Pa.
Consolidated	Textile bag sewing machine	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Constant	Non-scratch printing inks	American Printing Ink Div., Sun Chemical Corp., Chicago, Ill.
Container Slotter	Corrugated container slotter and creaser	E. G. Staude Mfg. Co., St. Paul, Minn.
Conti-Chrome	Screenless color reproductions	Continental Lithograph Corp., Cleveland, Ohio
Conti-Glo	Fluorescent lithographed displays, lacquers and coatings	Continental Lithograph Corp., Cleveland, Ohio
Conti-Glo Line	Ultraviolet assemblies	Continental Lithograph Corp., Cleveland, Ohio
Continental Gloss	Coated color embossed	Keller-Dorian Corp., New York, N. Y.
Continental Metalac	Coated color embossed, printed	Keller-Dorian Corp., New York, N. Y.
Copco	Coated papers	The Central Ohio Paper Co., Columbus, Ohio
Copperskin	Copper, waterproof laminated wrapper	Angier Corp., Framingham, Mass.
Cord-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Cordurette	Imitation cloth paper	C. R. Whiting Co., Inc., Hackensack, N. J.
Corkrusta	Imitation cork paper	C. R. Whiting Co., Inc., Hackensack, N. J.
Corktec	Imitation cork paper	Paper Affiliates Co., Inc., New York, N. Y.
Cork-Tex	Cork products (discs, sheets, rods, slabs etc.)	Bond Mfg. Corp., Inc., Wilmington, Del.
Corley-Miller	Paper sheeting and gluing machines	Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Corning Brand	Glass rod, tubing and tumblers	Corning Glass Works, Corning, N. Y.
Corrodek	Liners and trays	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Corroflex	Flexible corrugated paper	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Corrucrepe	All directional water creped kraft liner	Cincinnati Industries, Inc., Cincinnati (Lockland), Ohio
Corru-Fibre	Printing inks	J. M. Huber, Inc., New York, N. Y.
Corruflex	Display packages	Waldorf Paper Products Co., St. Paul, Minn.
Corrulined	Waterproof, paper-lined (vegetable glue) fabric bag	Cincinnati Industries, Inc., Cincinnati (Lockland), Ohio
Corseal	Roll-on tamperproof over cork closure	Aluminum Seal Co., New Kensington, Pa.
Cosmalite	Plastic impregnated paper tubes	The Cleveland Container Co., Cleveland, Ohio

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Cosmoline	Rust preventative compound	E. F. Houghton & Co., Phila., Pa.
Cotacord	Decorative tying cord—plastic covered	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Cottonluxe	Anti-tarnish sewn paper containers	Cottonluxe Mfg. Co., New York, N. Y.
Cottrel-Heinrich	Multi-color aniline printing press	H. H. Heinrich, Inc., New York, N. Y.
Counterboy	Sealing tape machines	Better Packages, Inc., Shelton, Conn.
Counter Clerk	Counter merchandising displays	Badger Merchandising Displays, Inc., Milwaukee, Wis.
Cover-Dri	Waterproof paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Coverite	Milk bottle closure	Sealright Co., Inc., Fulton, N. Y.
Cradle	Nursing bottles	Owens-Illinois Glass Co., Toledo, Ohio
Crate Top Coating	Asphalt compound	The Davison Chemical Corp., Baltimore, Md.
Cream Master Freezerwrap	Meat packer wrappers	H. P. Smith Paper Co., Chicago, I.
Crescent	Transparent waxed paper	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Cresco	Printing inks	Crescent Ink & Color Co. of Pa., Phila., Pa.
Crestone	Aniline ink	Crescent Ink & Color Co. of Pa., Phila., Pa.
Crest-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Cretan-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Cretonne	Fancy printed papers	Marvellum Co., Holyoke, Mass.
Crimptop	Thermoplastic bag closure	Miller & Miller, Atlanta, Ga.
Crinkle	Crepe paper	The Tuttle Press Co., Appleton, Wis.
Crinkle-Tie	Ribbons	Chicago Printed String Co., Chicago, Ill.
Cripseal	Closure	Owens-Illinois Glass Co., Toledo, Ohio
Crompaco	Water- and oil-proof papers	Cromwell Paper Co., Chicago, Ill.
Cross-Stitch	Embossed mica paper	Hazen-Paper Co., Holyoke, Mass.
Crown	Micro-crystalline wax	Petrolite Corp., Ltd., New York, N. Y.
Crown Brand	Pottery containers	The Robinson Clay Products Co. of N. Y., New York, N. Y.
Cruverplast	Molding material	Cruver Mfg. Co., Chicago, Ill.
Cry-O-Vac	Protective wrap for frozen foodstuffs	Dewey & Almy Chemical Co., Cambridge, Mass.
Cryptic	Printing inks	Crescent Ink & Color Co. of Pa., Phila., Pa.
Crystal	Coated box coverings	McLaurin-Jones Co., Brookfield, Mass.
Crystal	Asbestos	Scientific Filter Co., New York, N. Y.
Crystal Box	Rigid display container having transparent ends and front	Forbes Litho. Mfg. Co., The, Boston, Mass.
Crystallon	Mother-of-pearl box paper and cardboard	Riegel Paper Corp., New York, N. Y.
Crystal-Pak	Rigid cellulose containers	Transparent Specialties Mfg. Co., Cleveland, Ohio
Crystalustre	Paper lacquer	Maas & Waldstein Co., Newark, N. J.
Crystiphane	Transparent, thermoplastic paper	Newark Paraffine & Parchment Paper Co., Newark, N. J.
Cumberland	Box covering and printing papers	S. D. Warren Co., Boston, Mass.
Cuplette	Box paper	Kupfer Bros. Co., New York, N. Y.
Cup-Paks	Paper drinking cups	Dixie Cup Co., Easton, Pa.
Curley Q	Plastic covered wire	Taffel Bros., Inc., New York, N. Y.
Curv-O-Lite	Displays	E. G. Hayden & Co. Inc., New York, N. Y.
Cushion Stitch	Siftproof and moistureproof bag closure	Bagpak, Inc., New York, N. Y.
Cush-N-Rap	Unlined corrugated flexible wrapping	Ajax Box Co., Chicago, Ill.
D-B	Stencil cutting machines; stencilling supplies	Diagraph-Bradley Stencil Machine Corp., St. Louis, Mo.
D. C. Par. Wax	Transparent dipping wax	D. C. Cooper Co., Chicago, Ill.
D. C. Remover	Liquid for removing fingerprints	D. C. Cooper Co., Chicago, Ill.
D. C. Tanks	Heat and dipping tanks	D. C. Cooper Co., Chicago, Ill.
DL Krimpac	Semi-automatic packaging machine	Pack-Rite Machines, Milwaukee, Wis.
D-O-K	Deodorized kraft, water and grease resistant	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Dacro	Metal milk bottle caps, coverall	Crown Cork & Seal Co., Baltimore, Md.
Daka-Ware	Plastic tumblers and stock utility items	Harry Davies Molding Co., Chicago, Ill.
Damask	Embossed paper	Hampden Glazed Paper & Card Co., Holyoke, Mass.
Danagh	Counter displays	Robertson Paper Box Co., Inc., Montville, Conn.
Dan-D-Pak	Printed transparent wraps	Daniels Mfg. Co., Rhinelander, Wis.
Darex	Thermoplastic coatings, sealing compounds, adhesives	Dewey & Almy Chemical Co., Cambridge, Mass.
D'Artagnan	Cover paper	United Mfg. Co., Springfield, Mass.
Davco	Silica gel	Davison Chemical Corp., Baltimore, Md.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Daysette	Box paper	Kupfer Bros. Co., New York, N. Y.
Deco	Decorated boxes and baskets	Waldorf Paper Products Co., St. Paul, Minn.
Deco Board	Decorated board	Waldorf Paper Products Co., St. Paul, Minn.
Decopad	Protective padding	Geo. H. Sweetnam, Inc., Cambridge, Mass.
Decoufle	Soda straw and toothpick wrapping machines	Arenco Machine Co., Inc., New York, N. Y.
Deerflex	Supercalendered sulphite	Deerfield Glassine Co., Monroe Bridge, Mass.
Defender	Steel strapping	Signode Steel Strapping Co., Chicago, Ill.
Defoamer	Felt cleaners (for paper mfrs.)	Atlas Gum & Sizing Co., New York, N. Y.
Dehydrapac	Dehydrated packaging method	Shellmar Products Corp., Mt. Vernon, Ohio
Deko-Art	Colored and embossed foil	Reynolds Metals Co., Richmond, Va.
Deltaseal	Bag with pouring spout	Bemis Bro Bag Co., St. Louis, Mo.
De Luxe	Seed packets	Stecher-Traung Lithograph Corp., Rochester, N. Y.
Dependon	Box stays	McLaurin-Jones Co., Brookfield, Mass.
Desiccite #25 and #30	Dehydrating agents	Filtrol Corp., Los Angeles, Calif.
Design Craft	Display sets—corrugated	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Detecto	Scales	Detecto Scales, Inc., Bklyn, N.Y.
Detecto-Gram	Scales	Detecto Scales, Inc., Bklyn, N.Y.
Detecto-Matic	Scales	Detecto Scales, Inc., Bklyn, N.Y.
Dewalco	Adhesives	Dewey & Almy Chemical Co., Cambridge Mass.
Dewset	Instantaneous vapor setting inks	Frederick H. Levey Co., Inc., New York, N. Y.
Diacell	Filter	Karl Kiefer Machine Co., Cincinnati, Ohio
Diafané	Lacquered glassine heat-sealing	Riegel Paper Corp., New York, N. Y.
Diagonals	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Diamond	Thermoplastic tubing	The Visking Corp., Chicago, Ill.
Dia-Pak	Cellophane bag with cardboard cushion	Diaphane Bag Corp. of Pa., Phila., Pa.
Diastretch	Fluted paper used in waterproof, paper-lined fabrics	Fulton Bag & Cotton Mills, Atlanta, Ga.
Dignity Cheviot	Paper for box coverings	Pejepscot Paper Co., New York, N. Y.
DipWrap	Hot dip protective compound	Paisley Products, Inc., Chicago, Ill.
Disco	Imitation fabrics and wood grains	District of Columbia Paper Mills, Inc., Washington, D. C.
Diskup	Hot drink cup	The Sealright Co., Inc., Fulton, N. Y.
Dispersite	Natural and synthetic resins or elastomers dispersed in water or other medium	Dispersions Process, Inc., New York, N. Y.
Display-O	Self-opening window bag	Thomas M. Royal & Co., Phila. Pa.
Displayologist	Designers	Everett Young Co., Providence, R. I.
Dixie	Carton blanking machine	E. G. Staude Mfg. Co., St. Paul, Minn.
Dixie Cups	Paper drinking cups and containers	Dixie Cup Co., Easton, Pa.
Dolite	Cartons and boxes	The Dobeckmun Co., Cleveland, Ohio
Domino Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass
Domore	Automatic processing machines	Wood, Nathan & Virkus Co., Inc., Racine, Wis.
Doplex	Cellulose acetate laminated to plain or printed paper laminated cartons	The Dobeckmun Co., Cleveland, Ohio
Doplex Brilliant	Waterproof paper	The Dobeckmun Co., Cleveland, Ohio
Dotted Swiss	Box papers	Hazen Paper Co., Holyoke, Mass.
Doubledge	Cellophane wrapper with double thick ends	The Dobeckmun Co., Cleveland, Ohio
Double Duty	Gag gum	Stein, Hall & Co., Inc., New York, N. Y.
Double Duty	Wire-handle paper pail (locktop)	Sutherland Paper Co., Kalamazoo, Mich.
Double-Glaze	Supercalendered paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Double Plate	Filter	Karl Kiefer Machine Co., Cincinnati, Ohio
Double Royal White	Opaque sulphite, waxed or raw stock	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Doubletone	Secondary color inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Doughboy	Heat-sealing machines	Pack-Rite Machines, Milwaukee, Wis.
Dowicides	Germicides—fungicides	The Dow Chemical Co., Midland, Mich.
Drawlene	Enamels with special lubricants	Ault & Wiborg, Div. of Interchemical Corp., New York, N. Y.
Dri-Drum	Fibre drum	Beacon Container Co., New York, N. Y.
Dri-Ink	Marking colors	Floquil Products, Inc., New York, N. Y.
Dripcut	Syrup dispensers	Na-Mac Products Corp., Los Angeles, Calif.
Dri-Spray	Offset preventing device for all presses	Rutherford Machinery Co., Div., Sun Chemical Corp., New York, N. Y.

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TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Dri-Stik	Pressure sensitive adhesive on paper	Simon Adhesives Products Corp., New York, N. Y.
Dri-Tape	Heat-sealing tape	Seal, Inc., Shelton, Conn.
Drumpak	Corrugated drums	Gaylord Container Corp., St. Louis, Mo.
Drumtite	Can sealing compound	The Max Ams Machine Co., Bridgeport, Conn.
Dry-Hesive	Masking tapes	Gummed Tape & Devices Co., Bklyn, N. Y.
Dry Pack	Waterproof paper	W. Ralston & Co., Inc., Niagara Falls, N. Y.
Drytack	Transfer paper	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Dubar	Offset plate intensifier	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Dubl-Cushion	Cushion bottom egg carton	Bloomer Bros. Co., Newark, New York State
Dubl-Vu	Cartons, window	Rossotti Lithographing Co., Inc., N. Bergen, N. J.
Dukutone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Dullcoat	Suede mat coated papers	Marvellum Co., Holyoke, Mass.
Dullset	Printing inks	Geo. H. Morrill Div., Sun Chemical Corp., New York, N. Y.
Dulltone	Oil inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Dulseal	Gummed matted acetate sheeting	General Laminating, Inc., New York, N. Y.
Dundee Fabrics	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Dundee Plaid	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Dunnflex	Gelatine glues	Thomas W. Dunn Co., New York, N. Y.
Duo-Blo	Bottle and jar cleaning machine	Karl Kiefer Machine Co., Cincinnati, Ohio
Duo-Piston	Filling machine for viscous materials	Karl Kiefer Machine Co., Cincinnati, Ohio
Duo-Seal	Custom lamination	C. B. Henschel Mfg. Co., Milwaukee, Wis.
Duo-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Duotite	Laminated paper	Nashua Gummed & Coated Paper Co., Nashua, N. H.
Duplex	Shipping-display boxes	The Hinde & Dauch Paper Co., Sandusky, Ohio
Duplex	Labeling machines and accessories	Liquid Carbonic Corp., Chicago, Ill.
Duplex	Lug cap	National Seal Corp., Bklyn, N.Y.
Duraflm	Moisture-vaporproof cellulose film	The Dobeckmun Co., Cleveland, Ohio
Duraglas	Glass bottles, jars, containers	Owens-Illinois Glass Co., Toledo, Ohio; also Owens-Illinois Pacific Coast Co., San Francisco, Calif.
Duranite	Metal finishes	Atlas Powder Co., Zapon Div., Stamford, Conn., & N. Chicago, Ill.
Duranol	Transparent boxes; advertising displays	Joseph H. Meyer Bros., New York, N. Y.
Durapak	Parchmentized crate liner	Paterson Parchment Paper Co., Bristol, Pa.
Duratex	Crinkled kraft wrapping	Chase Bag Co., Chicago, Ill.
Duraflte	Tin printing ink	Crescent Ink & Color Co. of Pa., Phila. Pa.
Durawhite	Boxboard	Paper Package Co., Indianapolis, Ind.
Durez	Phenolic molding compounds, resins, varnish	Durez Plastics and Chemicals, Inc., N. Tonawanda, N. Y.
Durite	Phenol-aldehyde resins, molding compounds, adhesives and cements	Durite Plastics, Inc., Phila., Pa.
Durmas	Boxes and boxboards	Sample-Durick Co., Inc., Chicopee, Mass.
Durmaskote	Coating, for boxboard	Sample-Durick Co., Inc., Chicopee, Mass.
Duro	High strength fibreboard	Rogers Corp., Manchester, Conn.
Durtex	Dusting paper	Harvey Paper Products, Sturgis, Mich.
Dust-Proof	Dispensing spouts	Plastic Engineering, in Cleveland, Ohio
Du-Tone	Triple edge cellophane ribbons, gift wraps	Du-Tone Ribbon Corp., New York, N. Y.
Dux Bak	Waxed kraft	Central Waxed Paper Co., Chicago, Ill.
Dux-Pak	Carriers for cans and bottles	Brown & Bailey Co., Phila., Pa.
EZ	Hand operated air cleaner	U. S. Bottlers Machinery Co., Chicago, Ill.
E. Z. Lock	Locking device for bottom closure of folding carton	United Paperboard Co., New York, N. Y.
E-Z Mark	Write-on cellophane bags	Oneida Paper Products, Inc., New York, N. Y.
E-Z-Pac	Transparent bags	U. S. Envelope Co., Springfield, Mass.
E-Z Sealer	Jaw type bag krimper	Pack-Rite Machine Corp., Milwaukee, Wis.
E. Z. Teastrip	Paraffined containers	MonoServiceCo., Newark, N.J.
Eagle Solvent	Type wash	Eagle Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Eagloss	Gloss printing inks	Eagle Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Early American	Fancy printed Christmas papers	Louis Dejonge & Co., New York, N. Y.
Eastertone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Eastman	Cellulose acetate sheeting	Eastman Kodak Co., Rochester N. Y.
Easy Lift	Combination paper bag closure and handle	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Econo-Cards	Display cards	Waldorf Paper Products Co., St. Paul, Minn.
Economy	Mailing bag with address tag attached	Bemis Bro. Bag Co., St. Louis, Mo.
Economy	Fibre drums	Carpenter Container Co., Inc., Bklyn, N. Y.
Economy	Sprayko fluid	Chemical Color & Supply Div., Sun Chemical Corp., Chicago, Ill.
Economy	Weigher and carton sealer	Triangle Package Machinery Co., Chicago, Ill.
Economy Mailer	Mailing box	The Mason Box Co., Attleboro Falls, Mass.
Econopac	Specialty wraps	Milprint Inc., Milwaukee, Wis.
Edtbauer-Duplex	Automatic net weigher machines	B. F. Gump Co., Chicago, Ill.
Egyptian	Finishes for paper	The Egyptian Lacquer Mfg. Co., New York, N. Y.
Elasti-Cal	Decalcomania for the rubber industry	The Meyercord Co., Chicago, Ill.
Elastikraft	Single stretch creped kraft liner	Cincinnati Industries, Inc., Cincinnati (Lockland), Ohio
Elastobond	Rubber-resin emulsion cement	Paisley Products, Inc., Chicago, Ill.
Electrifugal	Liquid pumps	Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Elec-Tri-Pak	Automatic weighers	Triangle Package Machinery Co., Chicago, Ill.
Elec-Tri-Line	Automatic weighers with conveyors	Triangle Package Machinery Co., Chicago, Ill.
Electromoulds	Molds for injection molding	Design Center Inc., Flushing, L. I., N. Y.
Electro Tempered	Bottles	Owens-Illinois Glass Co., Toledo, Ohio
Ellisco	Cans	George D. Ellis & Sons, Inc., Phila., Pa.
Elmendorf	Tearing tester	Thwing-Albert Instrument Co., Phila. Pa.
Elvacet	Polyvinyl acetate	E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Elvanol	Polyvinyl alcohol	E. I. Du Pont de Nemours & Co., Inc., Wilmington, Del.
Embrite	Embossed coated papers	The Marvellum Co., Holyoke, Mass.
Emeloid	Thermoplastic fabricated articles	The Emeloid Co., Inc., Arlington, N. J.
Emerald Green	Druggists glassware	Owens-Illinois Glass Co., Toledo, Ohio
Empeco	Housefurnishing ware	National Can Corp., New York, N. Y.
Enamelay	Color tipped, embossed high finished box paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Enamelette	Pyroxylin papers	C. R. Whiting Co., Inc., Hackensack, N. J.
Enameltex	Ink embossed, high finished box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Enduro	Stainless steel for packaging equipment	Republic Steel Corp., Cleveland, Ohio
Endweld	Tube filling and sealing machine	Karl Kiefer Machine Co., Cincinnati, Ohio
Engineered Precision	Line of products	Gardner-Richardson Co., Middletown, Ohio
Engredel	Transparent decalcomania label	Palm, Fechteler & Co., New York, N. Y.
Epico	Printing inks	Eagle Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Ermold	Bottle labeling machines	Edward Ermold Co., New York, N. Y.
Essyew	Secondary color ink	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Estofilm	Plastic film	Mehl Manufacturing Co., Cincinnati, Ohio
Ethocel	Ethyl cellulose sheeting	The Dow Chemical Co., Midland, Mich.
Eureka	Rule press, Bendall attachment	J. F. Helmold & Bro., Inc., Chicago, Ill.
Evanstik	Tipping in paste	The Commercial Paste Co., Columbus, Ohio
Everyday	Packaged inks	International Printing Ink Div. of Interchemical Corp., New York, N. Y.
Every Use	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Exact Weight	Check-weighing and packaging scale	Exact Weight Scale Co., Columbus, Ohio
Excelite	Thermo-setting plastic materials	Designers for Industry, Inc., Cleveland, Ohio
Excell-O	Transparent ribbon	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Excluse-Wrap	Specialty wrapping paper	Yorkville Paper Co., Inc., New York, N. Y.
Executive	Lacquered wood grains, plain and embossed box-covers	District of Columbia Paper Mills, Inc., Washington, D. C.
Executive Velour	Suede finish	District of Columbia Paper Mills, Inc., Washington, D. C.
Ex-L-Ite	Tin plate	Republic Steel Corp., Cleveland Ohio
Expanseck	Shipping bag; multiple laminations, paper	Cincinnati Industries Inc., (Lockland) Cincinnati, Ohio
Exportex	Water-resistant V-Box, case liner, bag glues	Paisley Products, Inc., Chicago, Ill.
Express	Gum tape dispenser	Better Packages, Inc., Shelton, Conn.
Express Glue	Liquid labeling paste	National Adhesives, New York, N. Y.

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Eye-Petized	Illustrations of prepared food on labels and folding cartons	The United States Printing & Lithograph Co., Cincinnati (Norwood), Ohio
Eze-Stik	Pressure sensitive adhesive on paper	Simon Adhesive Products Corp., New York, N. Y.
FCC Colr-Type	Cotton ribbon	Fibre Cord Co., New York, N. Y.
FCC Ray Rib	Rayon ribbon	Fibre Cord Co., New York, N. Y.
FCC Two Tone	Cellophane ribbon	Fibre Cord Co., New York, N. Y.
F.M.C.	Machinery for canning, freezing, etc.	Food Machinery Corp., Hoopeston, Ill.
F. M. C. Hansen	Fillers for cans, jars, etc.	Food Machinery Corp., Hoopeston, Ill.
F. M. C. Kyler	Labelers and boxers	Food Machinery Corp., Hoopeston, Ill.
F.N.A.	Animal glue (cake form)	Paisley Products, Inc., Chicago, Ill.
Fabco	Valve flange protectors, board and envelope protectors	Fabricated Product, Co., Pittsburgh, Pa.
Fabkote	Pyroxylin coated cellulose base	E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Fabrikoid	Pyroxylin coated fabric	E. I. du Pont de Nemours & Co., Inc., Wilmington, Del
Facil Fab	Display material, cardboard on one side and rayon on the other	Facil Fabrics Co., New York, N. Y.
Felrette	Box paper	Kupfer Bros. Co., New York, N. Y.
Falco	Inks and supplies	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Falcote	Plate coating solution	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Fanfare	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Fast to Light	Flint and friction glazed papers	Wyomissing Glazed Paper Co., Reading, Pa.
Fendx	Asphalt compound	The Davison Chemical Corp., Baltimore, Md.
Fenox	Sealing compound	Bakelite Corp., New York, N. Y.
Fent-Onamel	Labels	Fenton Label Co., Phila., Pa.
Fenwood	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Fibercote	Leatherette	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Fiberpak	Fibre shipping drum	The Container Co., Div. Continental Can Co., Inc., Van Wert, Ohio
Fiber-Seal	Laminated papers	Marathon Corp., Menasha, Wis.
Fibestos	Cellulose acetate	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Fibo-Bilt	Die-cut display material	Badger Merchandising Displays, Inc., Milwaukee, Wis.
Fibo-Board	Special heavy mounting board	Badger Merchandising Displays, Inc., Milwaukee, Wis.
Fibre Lite	Box-board	Waldorf Paper Products Co., St. Paul, Minn.
Fibreen	Waterproof reinforced paper	Sisalkraft Co., Chicago, Ill.
Fibron	Plastic tape	Irvington Varnish & Insulator Co., Irvington, N. J.
Fidel-i-Tone	Reproduction process for fine screen color work	The Lord Baltimore Press, Baltimore, Md.
Fiesta Flowers	Fancy printed papers	Louis Dejonge & Co., New York, N. Y.
Filler-Flat	Interior egg case packing, molded pulp	Keyes Fibre Co., Waterville, Me.
Fill-Freeze	Cartons	Container Corp. of America, Chicago, Ill.
Filma-Seal	Tamperproof, moistureproof closure	Ferdinand Gutmann & Co., Bklyn, N. Y.
Filmhold	Offset plate intensifier	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Filmonize	Pressure sensitive tape	International Plastic Corp., Morristown, N. J.
Fi-Lox	Photo mailer	National Fiberstok Envelope Co., Phila., Pa.
Finco	Glue	F. G. Findley, Co., The, Milwaukee, Wis.
Fine Linen	Fancy printed	Louis Dejonge & Co., New York, N. Y.
Fine-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Fitchco	Board lining and paper	Fitchburg Paper Co., Fitchburg, Mass.
"5 Minute"	Fast drying ink	Capitol Printing Ink Co., Inc., Washington, D. C.
Flash Dri	Instantaneous heat setting ink	Fred'k H. Levey Co., Inc., New York, N. Y.
Flashdrier	Heating equipment for drying ink	Fred'k. H. Levey Co., Inc., New York, N. Y.
Flash Foils	Fancy paper	Louis Dejonge & Co.. New York, N. Y.
Flash-Pac	Strong set-up boxes	Gordon Cartons, Inc., Baltimore, Md.
Flat-As-A-Pancake	Gummed paper	The Brown-Bridge Mills Inc., Troy, Ohio
Flat-Tin-Can	Foil lined envelope	Tension Envelope Corp., Kansas City, Mo.
Flat-Top	Conveyor chain	Link-Belt Co., Chicago, Ill.
Flatwrap	Tightwrap glue for set-up boxes	Paisley Products, Inc., Chicago, Ill.
Flav-O-Fresh	Coffee bags, also waxed sandwich bags	Oneida Paper Products, Inc., New York, N. Y., also Continental Bag Specialties Corp., New York, N. Y.
Flav-O-Tainer	Air-tight waterproof lined bag	Thomas M. Royal & Co., Phila., Pa.
Fleetfold	Moistureproof-greaseproof tray	Sutherland Paper Co., Kalamazoo, Mich.
Fleurette	Box paper	Kupfer Bros. Co., New York, N. Y.
Flexback	Cold resin emulsion	National Adhesives, New York, N. Y.
Flex-Cote	Collapsible tube coating	Watson-Standard Co., Pittsburgh, Pa.
Flexi-Cap	Atomizer spray and dropper closures	Double Duty Products, Inc., Cleveland, O.
Flexi-Carton	Self-opening square bottom bag	Bemis Bro. Bag Co., St. Louis, Mo.
Flexiflat	Non-warp paste	Paisley Products, Inc., Chicago, Ill.
Flexlined	Waterproof, paper-lined (asphalt) fabric	Cincinnati Industries, Inc., Cincinnati (Lockland), Ohio
Flexo-Flint	Board lining and box cover	Matthias Paper Corp., Phila., Pa.
Flexo Paste	Non-wrinkling liquid paste	National Adhesives, New York, N. Y.
Flexotic	Folding box with 3 dimensional panels	National Folding Box Co., New Haven, Conn.
Flexoveyor	Conveyor, portable, flexible and reversible	E. C. Horne Machinery Co., Denver, Colo.
Flexpak	Flexible wrapping paper	Hinde & Dauch Paper Co., Sandusky, Ohio
Flexseal	Thermoplastic coated paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Flintex	Inks and varnishes	Howard Flint Ink Co., Detroit, Mich.
Flintlok	Two-piece folding glued corner style	Hollywood Paper Box Div., The Flintkote Co., Hollywood, Calif.
Flintspray	Anti-offset spray solution	Howard Flint Ink Co., Detroit, Mich.
Flipseal	"V" metal snap-on type cap for vacuum glass containers	The Aridor Closure Div. of Ball Bros. Co., Chicago, Ill.
Flipseal "H"	Metal snap-on type cap for non-vacuum glass containers	The Aridor Closure Div. of Ball Bros. Co., Chicago, Ill.
Floor-Veyor	Power belt conveyor	The Rapids Standard Co., Inc., Grand Rapids, Mich.
FloQuil	Instant drying waterproof ink	Floquil Products Inc., New York, N. Y.
Floradora	Lace box papers	Hazen Paper Co., Holyoke, Mass.
Flor-A-Fresh	Cellophane bags for flowers	Oneida Paper Products, Inc., New York, N. Y., also Continental Bag Specialties Corp., New York, N. Y.
Floralettes	Cellophane mats	Shellmar Products Corp., Mt. Vernon, Ohio
Floretta	Florists crepe paper	The Tuttle Press Co., Appleton, Wis.
Flousine	Padding paper	George H. Sweetnam, Inc., Cambridge, Mass.
Flowers and Frills	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Flowers and Ribbon	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Follette	Box paper	Kupfer Bros. Co., New York, N. Y.
Foil Sea Shell Swirl	Box cover paper	Chas. W. Williams & Co., Inc. New York, N. Y.
Foilsman	Foil papers	C. R. Whiting Co., Inc., Hackensack, N. J.
Foldex	Folding box liquid adhesive	Stein, Hall & Co., Inc., New York, N. Y.
Fold-N-Rap	Flexible wrapping	Ajax Box Co., Chicago, Ill.
Foldomatic	Collapsible cartons	Interstate Folding Box Co., Middletown, Ohio
Fold-Pak	Shipping cartons	Container Corp. of America, Chicago, Ill.
Foldtite	Mailing box	The C. J. Fox Co., Providence, R. I.
Folia Ting	Adhesives and acetate (special)	Mor-Gan Laminating & Foliating Co., New York, N. Y.
Food Packs	Drinking containers	Dixie Cup Co., Easton, Pa.
Food Pak	Plain cellophane bags	Milprint, Inc., Milwaukee, Wis.
Force	Case numbering machines	Wm. A. Force & Co., Inc., Bklyn, N. Y.
Formator	Machines for cigar industry	Arenco Machine Co., Inc., New York, N. Y.
For-Ply	Plywood shipping drum	Seymour & Peck Co., Chicago, Ill.
Forticel	Cellulose propionate molding compounds	Celanese Plastics Corp., New York, N. Y.
Fort Wayne	Corrugated egg case	Fort Wayne Corrugated Paper Co., Fort Wayne, Ind.
Foxocals	Decalcomania transfers	The Foxon Co., Providence, R. I.
Foxon	Labels, tags, seals	The Foxon Co., Providence, R. I.
Foxoseals	Labels, tags, seals	The Foxon Co., Providence, R. I.
Foxotone	Unusual color-tone labels, embossed	The Foxon Co., Providence, R. I.
Frame-Vue	Folding box, double end and side walls	National Folding Box Co., New Haven, Conn.
Frame-Vue	Paper cartons, double end and side walls	The C. W. Zumbiel Co., Cincinnati (Norwood), Ohio
Fra-Pac	Ice cream package	Bloomer Bros. Co., Newark, New York State
Freeze-Rite	Frozen food paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Freezerwrap	Meat packer wrappers	H. P. Smith Paper Co., Chicago, Ill.
Freez-Pac	Coated parchment	E. W. Twitchell Inc., Pkg. Div., Phila., Pa.
Freeztex	Frozen food locker packages	Marathon Corp., Menasha, Wis.
Freez-Tex	Frozen food locker paper	E. W. Twitchell, Inc., Pkg. Div., Phila., Pa.
Fresheen	Waxed glassine bags	Dixie Wax Paper Co., Dallas, Texas

Addresses of companies listed appear on pages 1022–1033

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TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Frigerwrap	Airseal packaging paper	Central Paper Co., Inc., Muskegon, Mich.
Frigid Board	Cold storage stock	Waldorf Paper Products Co., St. Paul, Minn.
Frostel	Pyroxylin metallic papers for labels, box coverings, etc.	Plastic Coating Corp., Holyoke, Mass.
Frostex	Frozen food bags and paper	Newark Paraffine & Parchment Paper Co., Newark, N. J.
Frostofold	Prelined frozen food containers and packaging kits	Interstate Folding Box Co., Middletown, Ohio
Frostpak	Frozen food base papers	S. D. Warren Co., Boston, Mass.
Frost-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Full-Flow	Metal liquid shipping container	Wheeling Corrugating Co., Wheeling, W. Va.
Full Measure	Stock printed cellophane bags	The Dobeckmun Co., Cleveland, Ohio
Ful-Lok	Cellophane satchel bottom bags	Oneida Paper Products, Inc., New York, N. Y.
		Continental Bag Specialties Corp., New York, N. Y.
Full View	Box window top	W. H. Deisroth Co., Inc., Phila., Pa.
Furniture Wrap	Waterproof wrapper for furniture	H. P. Smith Paper Co., Chicago, Ill.
Fusedge	Ribbon made of cut sealed acetate fabric	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Gadget Mailers	Mailing cartons	Calumet Carton Co., Harvey, Ill.
Gala	Casein	George Morrell Corp., Muskegon Heights, Mich.
Galorn	Casein plastic	George Morrell Corp., Muskegon Heights, Mich.
Gator Hide	Kraft paper	George & Sherrard Paper Co., New York, N. Y.
Gaylord	Fibre boxes and folding cartons	Gaylord Container Corp., St. Louis, Mo.
Gem	Light-duty round nested paper containers	Lily-Tulip Cup Corp., New York, N. Y.
Gem	Micro-crystalline wax	Petrolite Corp., Ltd., New York, N. Y.
Gemcote	Plastic finishing	Gemloid Corp., Elmhurst, L. I., N. Y.
Gemlike	Jewell effect, sheet form	Gemloid Corp., Elmhurst, L. I., N. Y.
Gemlite	Injection molding	Gemloid Corp., Elmhurst, L. I., N. Y.
Gemloid and Enameloid Cloisonné	Plastic sheets with cloisonné designs	Gemloid Corp., Elmhurst, L. I., N. Y.
Gemstone	Phenol-formaldehyde cast resins	A. Knoedler Co., Lancaster, Pa.
Gem-Tone	Gloss printing ink	International Printing Ink and Finishes Divs., Interchemical Corp., New York, N. Y.
Gem Weld	Transparent flexible covers	Gemloid Corp., Elmhurst, L. I. N. Y.
General	Box gluing machine	E. G. Staude Mfg. Co., St., Paul, Minn.
Geon Latex	Water-borne polyvinyl resin	B. F. Goodrich Chemical Co., Cleveland, Ohio
Geon Plastic Latices	Geon latex with plasticizer added	B. F. Goodrich Chemical Co., Cleveland, Ohio
Geon Plastics	Plasticized Geon resins	B. F. Goodrich Chemical Co., Cleveland, Ohio
Geon Resins	Polymers of vinyl chloride and copolymers of vinyl chloride and vinylidene chloride	B. F. Goodrich Chemical Co., Cleveland, Ohio
Georgian Silver	Inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Giant-Curve	Corrugated display material	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Gift Shop	Box cover paper	Chas. W. Williams & Co., inc., New York, N. Y.
Glazed Chintz	Printed flint paper	Hampden Glazed Paper and Card Co., Holyoke, Mass.
Glidden E. C.	Hot dip stripping compound	Glidden Co., The, Cleveland, Ohio
Globe	Automatic gluing and sheeting machines; bar creaser for transparent sheeting	Globe Mfg. Co., Phila., Pa.
Globular	Parchment padding paper	George H. Sweetnam, Inc., Cambridge, Mass.
Glo-Ray	Gloss inks	International Prtg. Ink Div. of Interchemical Corp., New York, N. Y.
Glorette	Box paper	Kupfer Bros. Co., New York, N. Y.
Gloss Colorcote	Color gloss surface for packaging	Brooks Bank Note Co., Springfield, Mass.
Glosscote	Boxboard	Brooks Bank Note Co., Springfield, Mass.
Glosset	Quick drying, high finish ink	Fred'k. H. Levey Co., Inc., New York, N. Y.
Glossiroll	Corrugated paper display material	Excelsior Paper Specialties Co., New York, N. Y.
Glostone	High gloss printing inks	American Printing Ink Div., Sun Chemical Corp., Chicago, Ill.
Glostone	Box cover paper	Paper City Mfg. Co., Inc., Holyoke, Mass.
Glorwite	Patent coated boxboard	Brooks Bank Note Co., Springfield, Mass.
Glow-Cote	Transparent top sizing for labels and wraps	Cambridge Paper Box Co., Cambridge, Mass.
Gluaid	Animal glue extender	Stein, Hall & Co., Inc., New York, N. Y.
Glue-Fast	Glues	Glue Fast Equipment Co., Inc., New York, N. Y.
Gluex	Animal glue extender	Stein, Hall & Co., Inc., New York, N. Y.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Glu-O-Matic	Automatically glued folding boxes	Spear Box Co., Inc., New York, N. Y.
Glu-Pa-Co	Vegetable glue	The F. G. Findley Co., Milwaukee, Wis.
Glu-Weld	Waterproof adhesive	The F. G. Findley Co., Milwaukee, Wis.
		Union Paste Co., Hyde Park, Mass.
Glu-X-Tender	Blender for animal and flexible glues	The F. G. Findley Co., Milwaukee, Wis.
Goldentone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Goldlite	Imitation foil	Louis Dejonge & Co., New York, N. Y.
Gold-Medal	Solid fibre beer carriers	Gaylord Container. Corp., St. Louis, Mo.
Gold Seal	Adhesives	Dewey & Almy Chemical Co., Cambridge, Mass.
Goldseal	Colored specialty tapes	Gummed Tape & Devices Co., Bklyn, N. Y.
Goldsheen	Metallic inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Gold Standard	Bleached kraft wrapping	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Goldy	Bottle closure	Aluminum Seal Co., New Kensington, Pa.
Golveneer	Inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Go Safe	Mailing boxes	Everett Young Co., Providence, R. I.
Gravity	Roller conveyors and spiral chutes	Standard Conveyor Co., N St. Paul, Minn.
Gravitygram	Predetermined weight scale	Toledo Scale Co., Toledo, Ohio
Graywire	Display racks	The Gray Wire Specialty Co., Cleveland, Ohio
Greasene	Grease resistant boxboard	The Gardner-Richardson Co., Middletown, Ohio
Greasetite	Grease resistant boxboard	Waldorf Paper Products Co., St. Paul, Minn.
Green Core	Gummed cloth tapes	Mid-States Gummed Paper Co., Chicago, Ill.
Greystone	Clasp envelopes	American Paper Goods Co., Kensington, Conn.
Grip-Tight	Label paste for tin, metals	Paisley Products, Inc., Chicago, Ill.
Grip-Tite	Gummed tape	Chicago Gum Tape Co., Chicago, Ill.
Grizzlybear	Waterproof wrapper	Angier Corp., Framingham, Mass.
Guardian	Tamperproof aluminum bottle closures	Guardian Safety Seal Co., Chicago, Ill.
Guardsman	Cover paper	United Mfg. Co., Springfield, Mass
Gumcraft	Gummed tapes	Gummed Tape & Devices Co., Bklyn, N. Y.
Gumcraft Liflat	Flat label paper	Gummed Tape & Devices Co., Bklyn, N. Y.
Gum Tape-Aid	Tape moistening solution	Paisley Products, Inc., Chicago, Ill.
H & D	Corrugated shipping boxes	The Hinde & Dauch Paper Co. Sandusky, Ohio
HFN	Gelatinous, semi-iceproof bottle labeling gum	National Adhesives, New York, N. Y.
Haller	Filling machines	Horix Mfg. Co., Pittsburgh, Pa.
Halyard	Serrated friction caps	Anchor Hocking Glass Corp., Lancaster, Ohio
Hammerclear	Carton sealing paper	Hamersley Mfg. Co., Inc., Garfield, N. J.
Hammerglass	Glassine paper	Hamersley Mfg. Co., Inc., Garfield, N. J.
Hammerglint	Tarnish resistant paper	Hamersley Mfg. Co., Inc., Garfield, N. J.
Hammer-Parchment	Greaseproof paper	Hamersley Mfg. Co., Inc., Garfield, N. J.
Hampak	Printed transparent wraps	Daniels Mfg. Co., Rhinelander, Wis.
Handelok	Carry bag	Wolf Bros., Phila., Pa.
Handilift	Tiering machine	Standard Conveyor Co., N. St. Paul, Minn.
Handi-Quart	Milk bottles	Owens-Illinois Glass Co., Toledo, Ohio
Handirol	Gummed package products	Gummed Tape & Devices Co., Bklyn, N. Y.
Handy Angle	Fountain stencil brushes	Ideal Stencil Machine Co., Belleville, Ill.
Handy Service	Package of sterilized glass bottles	Owens-Illinois Glass Co., Toledo, Ohio
Hang-Rite	Garment holders	Waldorf Paper Products Co., St. Paul, Minn.
Hardshell	Halftone inks	Eagle Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Hard-Tex	Metal decorating inks	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Hartglass	Embossed sulphite	Hartford City Paper Co., Hartford City, Ind.
Hayssen	Automatic wrapping and slicing machinery	Hayssen Mfg. Co., Sheboygan, Wis.
Hazenkote	Pyroxylin coated paper	Hazen Paper Co., Holyoke, Mass.
Heat-O-Seal	Heatseal labels	Tomkins' Label Service, Phila., Pa.
Helmco	Displays	Helmco, Inc., Chicago, Ill.
Henryco	Set-up paper boxes	Ira L. Henry Co., Watertown, N. Y.
Hercules	Rule cutter	J. F. Helmold & Bro., Inc., Chicago, Ill.

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TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Heresite	Plastic coating and molding compounds	Heresite & Chemical Co., Manitowoc, Wis.
Hermetican	Air tight tamperproof aluminum canister	Guardian Safety Seal Co., Chicago, Ill.
Hermeti-Pak	Folding carton	Frankenberg Bros., Inc., Columbus, Ohio
Hermeti-Seal	Heat-sealable innerlined carton	Frankenberg Bros., Inc., Columbus, Ohio
Hermo	Can sealing compound	The Max Ams Machine Co., Bridgeport, Conn.
Hesitco	Plastic hypodermic needle protectors, dropper bulbs, tube and pipe caps, wire caps	Heat Seal-It Co., Phila., Pa.
Hiawatha	Out-folding carton gluer	E. G. Staude Mfg. Co., St. Paul, Minn.
Hi-Binder	Foil papers	The Central Ohio Paper Co., Columbus, Ohio
Hi-Binder	Moisture-vaporproof wrapping materials	The Floyd A. Holes Co., Bedford, Ohio
HI-Gear	Automatic cartons	Fibreboard Products Inc., San Francisco, Calif.
High Speed	Automatic printing press	Miller Printing Machinery Co., Pittsburgh, Pa.
Higlo	Gloss printing inks	J. M. Huber, Inc., New York, N. Y.
Hi-Gloss	Inks and varnishes	Pope & Gray, Inc., New York, N. Y.
HI-Gloss	Base paper for lacquer	S. D. Warren Co., Boston, Mass.
Hi-Lite	Opaque white flexible containers	Hi-Land Paper Products Co., Ossining, N. Y.
HI-Low	Composite paper and shipping cartons	Container Corp. of America, Chicago, Ill.
Himes	One-piece box	American Box Board Co., Grand Rapids, Mich.
HI-Paco	Cartons for sheets, pillow cases, etc.	High Point Paper Box Co., Inc., High Point, N. C.
HI-Pak	Cellophane bags for bulk groceries	Thomas M. Royal & Co., Phila., Pa.
Hoepner	Automatic scales, dry filling equipment, sewing machines, bag closures	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Holdfast	Glues	The F. G. Findley Co., Milwaukee, Wis.
Holdfast	Black inks	International Printing Ink, Div. of Interchemical Corp., New York, N. Y.
Holly Scroll	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Hollykote	Special moisture-and grease-proof treatment on paper board	Hollywood Paper Box, Div. The Flintkote Co., Hollywood, Calif.
Holm Scale	Filling machine	Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Hooper	Corrugating, printing, container making machinery	F. X. Hooper Co., Inc., Glenarm, Md.
Hopewell Kraft	Kraft paper products	Hummel-Ross Fibre Corp., Hopewell, Va.
Horix	Liquid fillers, conveyors	Horix Mfg. Co., Pittsburgh, Pa.
Horix Haller	Liquid fillers	Horix Mfg. Co., Pittsburgh, Pa.
H-Scale	Synthetic pearl essence	Celanese Chemical Corp., New York, N. Y.
Hub	Extra heavy kraft grocery bags	Consolidated Paper Bag Co., Somerville, Mass.
Huebills	Box papers	Hazen Paper Co., Holyoke, Mass.
Humi-Jar	Jar	Owens-Illinois Glass Co., Toledo, Ohio
Humi-Pak	Waterproof ream wrappers	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Humitube	Bags, pouches, tubes and envelopes of cellophane	Humitube Mfg. Co., Peoria, Ill.
Hyalac	Window signs and decorations	The Meyercord Co., Chicago, Ill.
Hycar	Butadiene type synthetic rubber	B. F. Goodrich Chemical Co., Cleveland, Ohio
Hychex	Plastic tubes	Hychex Products, Chicago, Ill.
Hycoloid	Cellulose nitrate tubes and applicators	Celluplastic Corp., Newark, N. J.
Hydratite	Water-resistant paste	National Adhesives, New York, N. Y.
Hydrotite	Asphalt center boxboard	The Gardner-Richardson Co., Middletown, Ohio
Hydry	Steam-set inks	Sun Chemical Corp., New York, N. Y.
Hy-Glaze	Kraft, machine-glazed paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Hy-Glos	Gummed and ungummed labels	Tompkins' Label Service, Phila., Pa.
Hy-Gloss	Self sealing sulphite bread wrapper	Pollock Paper & Box Co., Dallas, Texas
Hy-Lustre	Gloss inks	Robinson Tag & Label Co., New York, N. Y.
Hyroto	Rotogravure printing machine	Rotogravure Engineering Co., E. Boston, Mass.
Hy-Speed	Bottling machinery	Alsop Engineering Corp., New York, N. Y.
Hy-Tra-Lac	Weigher	Wright's Automatic Machinery Co., Durham, N. C.
IPI	Printing inks	International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Ice Cream Pack	Ice cream fibre drum	Beacon Container Co., New York, N. Y.
Iceberg	All purpose food wrap	Central Paper Co., Inc., Muskegon, Mich.
Ice-stick	Ice proof bottle label glue	Paisley Products, Inc., Chicago, Ill.
Ideal	Bucket type elevators	B. F. Gump Co., Chicago, Ill.
Ideal	Wire stitching machine	Ideal Stitcher & Mfg. Co., Racine, Wis.
Ideal	Two-tube hand vacuum filler	U. S. Bottlers Machinery Co., Chicago, Ill.
Ideal, The	Stencil cutting machines	Ideal Stencil Machine Co., Belleville, Ill.
Illinois	Druggists glassware	Owens-Illinois Glass Co., Toledo, Ohio
Illustra-Color	Lithographic prints	The U. S. Printing & Lithograph Co., Cincinnati (Norwood), Ohio
Imperial Plastic Hardware	Handlers, knobs, pulls, etc.	Imperial Molded Products Corp., Chicago, Ill.
Impervite	Enameled closure paper	General Felt Products Div., Standard Cap & Seal Corp., Bklyn, N. Y.
Impervite	Oil treated paper	W. Ralston & Co., Inc., Niagara Falls, N. Y.
Impervo	Outdoor display	Arvey Corp., Chicago, Ill.
Impervo	Label gum	National Adhesives, New York, N. Y.
Impression	Ink embossed coated paper	The Marvellum Co., Holyoke, Mass.
Inceloid	Resin adhesives, protective coatings, transparent sheeting	American Products Mfg. Co., New Orleans, La.
Inco-Pads	Corrugated colored display material	Inland Container Corp., Indianapolis, Ind.
Inco-Rolls	Single face corrugated colored display	Inland Container Corp., Indianapolis, Ind.
Inco-Steps	Corrugated colored display material	Inland Container Corp., Indianapolis, Ind.
Indette	Box paper	Kupfer Bros. Co., New York, N. Y.
Indur	Phenolic molding compounds, resins, varnishes	Reilly Tar & Chemical Corp., Indianapolis, Ind.
Induwrap	Greaseproof paper	Angier Corp., Framingham, Mass.
Inerwov	Reinforced asphalt laminated gummed tape	Atlantic Gummed Paper Corp., Bklyn, N. Y.
Innercoat	Plain waterproof wrapping	Angier Corp., Framingham, Mass.
Inner-Lined	Prelined cartons	Interstate Folding Box Co., Middletown, Ohio
Innerstrung	Reinforced waterproof wrapping paper	Angier Corp., Framingham, Mass.
Innerstrung	Reinforced waterproof paper	W. Ralston & Co., Inc., Niagara Falls, N. Y.
Inpac	Folding cartons	Industrial Packaging Co., Bklyn, N. Y.
"Insite" Signs	Decalcomania transfers	Milprint, Inc., Milwaukee, Wis.
Insulux	Glass block	Owens-Illinois Glass Co., Toledo, Ohio
Insurok	Custom laminated and molded plastic	The Richardson Co., Melrose Park, Ill.
Isyn-Gloss	Transparent sulphite, waxed	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
In-Tag	Gravure inks	In-Tag Div., Interchemical Corp., New York, N. Y.
International	Automatic box making machinery	International Paper Box Machine Co., Nashua, N. H.
Isyngloss	Transparent waxed paper (self sealing)	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Itstix	Tape, gummed	Nashua Gummed & Coated Paper Co., Nashua, N. H.
Ivanhoe	Paper boxes	Cambridge Paper Box Co., Cambridge, Mass.
Ivorytone	Opaque coated paper	Newark Paraffine & Parchment Paper Co., Newark, N. J.
J.M.	Stripping glue for set-up boxes	Paisley Products, Inc., Chicago, Ill.
JW-Jr.	High-speed bottle washer	U. S. Bottlers Machinery Co., Chicago, Ill.
Jack Frost	Frosting for glass bottles	McKay Co., Bklyn, N. Y.
Jacquard	Embossed and tipped papers	Marvellum Co., Holyoke Mass.
Jalcold	Tin plate	Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Jay Cee	Silica gel, desiccant	Joliet Chemicals, Ltd., Joliet, Ill.
Jaypaco	Laminated board	Jaypaco Co., New York, N. Y.
Jaypaco	Wadding tissue	Joe Salwen Paper Co., New York, N. Y.
Jet Black	Micro-crystalline wax	Petrolite Corp., Ltd., New York, N. Y.
Jiffy	Insulated paper bags, pads and cartons	Jiffy Mfg. Co., Hillside, N. J.
Johnson	Machines, carton forming, lining, filling, folding, closing	Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich.
Joniflex	Cloth pressure sensitive tape	Industrial Tape Corp., New Brunswick, N. J.
Judy	Rayon ribbon	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Jupiter Gum	Dry form dextrine adhesive	Paisley Products, Inc., Chicago, Ill.
Justrite	Marking equipment, industrial inks	Louis Melind, Chicago, Ill.
KD 8	Heat seal coated	Keller-Dorian Corp., New York, N. Y.
KG 2W	Heat seal coated	Keller-Dorian Corp., New York, N. Y.
K.E.M.	Thermosetting molding compound	Interlake Chemical Corp., Cleveland, Ohio
K V P	Waxed papers, plain and printed	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Kake Hot	Pick up cement	The F. G. Findley Co., Milwaukee, Wis.
Kakimaco	Filter	Karl Kiefer Machine Co., Cincinnati, Ohio
Kala Cork	Cork paper	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.

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TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Kalafilm	Wrapping paper	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Kan-D-Pak	Opaque white glassine candy wrappers	Daniels Mfg. Co., Rhinelander, Wis.
Kartridg-Pak	Banding for sausages	Marathon Corp., Menasha, Wis.
Kaumark	Water-soluble marking ink	Kaumagraph Co., Wilmington, Del.
Kay-Dee-Pac	Paper pails	Container Corp. of America, Chicago, Ill.
Kaydel	Moisture gauges	Hart Moisture Gauges, Inc., New York, N. Y.
Kaygrey	High strength fibreboard	Rogers Corp., Manchester, Conn.
Kaylon	Transparent unsupported film and coated fabrics	Gordon-Lacey Chemical Prods. Co., Maspeth, L. I., N. Y.
Kaypar	High strength fibreboard	Rogers Corp., Manchester, Conn.
Kayseal	Case sealing liquid adhesive	Stein, Hall & Co., Inc., New York, N. Y.
Keepdry	Cloth-lined wrap	Angier Corp., Framingham, Mass.
Keglined	Beer and ale cans	American Can Co., New York, N. Y.
Keko	Plastic coated cloth bags, covers; moth repellent garment storage bags	Kennedy Car Liner & Bag Co., Inc., Shelbyville, Ind.
Kemgo	Printing compound	Markem Machine Co., Keene, N. H.
Kennecot	Pyroxylin coated papers	C. R. Whiting Co., Inc., Hackensack, N. J.
Kensington	Clasp envelopes	American Paper Goods Co., Kensington, Conn.
Keratol	Imitation leather	Atlas Powder Co., Zapon Div., Stamford, Conn.
Keystone Stay	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Kidette	Box paper	Kupfer Bros. Co., New York, N. Y.
Kidskin	Pyroxylin box papers	Hazen Paper Co., Holyoke, Mass.
Kiltie Plaids	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Kimpak	Protective packing, creped wadding	Kimberly-Clark Corp., Neenah, Wis.
Kingcote	Suede finish cotton stock	Rayon Processing Co. of R. I., Central Falls, R. I.
King Markwell	Marking and printing inks	Markem Machine Co., Keene, N. H.
Kivar	Artificial leather	The Plastic Coating Corp., Holyoke, Mass.
Kleen	Printing inks, lithographic supplies	International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Kleen Quick	Roller cleaner	International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Kleen Kups	Paper food containers	Mono Containers, Div. Continental Can Co., Newark, N. J.
Kleen Seal	Sanitary tamperproof seal	Mono Containers, Div. Continental Can Co., Newark, N. J.
Kleenway	Garbage and general utility bags	Oneida Paper Prods., Inc., New York, N. Y. Continental Bag Specialties Corp., New York, N. Y.
Kleer Glaze	Transparent waxed paper	Central Waxed Paper Co., Chicago, Ill.
Kleer View	Waxed glassine	Central Waxed Paper Co., Chicago, Ill.
Kleerview	Transparent glassine	Rhinelander Paper Co., Rhinelander, Wis.
Kliktop	Latching hinged-cover box	National Folding Box Co., New Haven, Conn.
Kling	Stamping ink for metal and non-porous materials	Louis Melind Co., Chicago, Ill.
Klondike	Gold and silver casein papers	C. R. Whiting Co., Inc., Hackensack, N. J.
Klothwhite	Retail store wrapping paper	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Knife-O	Closure	Owens-Illinois Glass Co., Toledo, Ohio
Kodaloid	Cellulose nitrate sheeting	Eastman Kodak Co., Rochester N. Y.
Kodapak	Thin cellulose ester sheeting	Eastman Kodak Co., Rochester, N .Y.
Kodatape	Gummed cloth tape	Eastman Kodak Co., Rochester, N. Y.
Koloprint	Automatic direct printing labeling machine (cans, bottles, etc.)	Designers for Industry, Inc., Cleveland, Ohio
Kork-N-Seal	Can cappers	Crown Cork & Seal Co., Baltimore, Md. Williams Sealing Corp., Decatur, Ill.
Korogel	Soft form of Koroseal	B. F. Goodrich Co., Akron, Ohio
Korolac	Solution of Koroseal	B. F. Goodrich Co., Akron, Ohio
Koroseal	Plasticized polyvinyl chloride	B. F. Goodrich Co., Akron, Ohio
Kote Strip	Ethyl cellulose coating	E. F. Houghton & Co., Phila., Pa.
Kotol	Protective coatings	United States Rubber Co., New York, N. Y.
Kraflex	Gummed kraft paper sealing tape	Central Paper Co., Menasha, Wis.
Krimpac	Specialty wraps	Milprint, Inc., Milwaukee, Wis.
Kriston	Thermo-setting allyl ester	B. F. Goodrich Chemical Co., Cleveland, Ohio
Kromekote	Cast coated high finish paper	The Champion Paper & Fibre Co., Hamilton, Ohio
K-600	Leatherette	Narragansett Coated Paper Corp., Pawtucket, R. I.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Kubro Leatherette	Box cover paper	Kupfer Bros. Co., New York, N. Y.
Kum-Kleen	Labels, pressure-sensitive	Avery Adhesives, Los Angeles, Calif.
KwickKlasp	Mailing boxes	W. H. Deisroth Co., Inc., Phila., Pa.
Kwik-Kleen	Filters (water)	The Liquid Carbonic Corp., Chicago, Ill.
Kwikset	Paper cartons	Container Corp. of America, Chicago, Ill.
Kwik-Way	Nameplates	Meyercord Co., Chicago, Ill.
Kys-ite	Fibrous plastic products	Keyes Fibre Co., Waterville, Me.
Kysped	Interior egg case packing, molding pulp	Keyes Fibre Co., Waterville, Me.
L-B-Cote	Flexible, high gloss, protective coating	The Lord Baltimore Press, Baltimore, Md.
L.N.F.	Bond inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Labco Fibre	Kraft board	The LaBolteaux Co., Inc., Cincinnati, Ohio
LabeLid	Ointment boxes	Columbia Specialty Co., Inc., Baltimore, Md.
Labelrite	Fully automatic labeling equipment	New Jersey Machine Corp., Hoboken, N. J.
Labelstik	Metal ointment boxes	George D. Ellis & Sons, Inc., Phila., Pa.
Lace and Flowers	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Lace Frills	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Lacqueleather	Waterproof leather papers	C. R. Whiting Co., Inc., Hackensack, N. J.
Lac-R-Print	Lacquered bags	Thomas M. Royal & Co., Phila., Pa.
Lafayette	Box covering paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Lamatex	Ethylcellulose laminated cloth	Wills & Roberts Plastics Mfg. Corp., Pasadena, Calif.
Lamatex Solution	Ethylcellulose laminating lacquer	Wills & Roberts Plastics Mfg. Corp., Pasadena, Calif.
Lamcote	Laminating of paper, films	Arvey Corp., Chicago, Ill.
Lamcote Cover	Cover stock	Arvey Corp., Chicago, Ill.
Lamcote Fabrics	Cellulose laminated fabrics	Arvey Corp., Chicago, Ill.
Laminac	Polyester copolymer resin	American Cyanamid Co., Plastics Div., New York, N. Y.
Laminem	Laminated paper, cloth, foil	General Laminating Co., New York, N. Y.
Laminizing	Combination of cellulose acetate sheets to paper	U. S. Finishing & Mfg. Co., Chicago, Ill.
Laminoid	Combining of cellulose acetate to paper, textiles	Laminoid, Inc., N. Bergen, N. J.
Lamiphane	Transparent high gloss vinyl finish for labels, wrappers	Stecher-Traung Litho. Corp., Rochester, N. Y.
Lam-Lac	High-gloss lacquer finish	F. N. Burt Co., Inc., Buffalo, N. Y.
Lamoilm	Simplex moistureproof bags or moistureproof liners	Benj. C. Betner Co., Devon, Pa.
Lam-O-Flex	Laminated special bags	Oneida Paper Products, Inc., New York, N. Y.
Lard Pak	Printed transparent wraps	Daniels Mfg. Co., Rhinelander, Wis.
Lard-Pak	Lard and shortening wrap	Rhinelander Paper Co., Rhinelander, Wis.
Latham	Carton stitchers	Bostitch, Inc., East Greenwich, R. I.
Latham	Wire stitchers	Dexter Folder Co., New York, N. Y.
Lattisette	Box paper	Kupfer Bros. Co., New York, N. Y.
Lavette	Box paper	Kupfer Bros. Co., New York, N. Y.
Leafage	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Leathaflex	Leather cement	Paisley Products, Inc., Chicago, Ill.
Leatherette	Box paper	Kupfer Bros. Co., New York, N. Y.
Leatherette	Waterproof leather finished papers	The Marvellum Co., Holyoke, Mass.
Leather Foil	Marking foils for leather	Peerless Roll Leaf Co., Inc., Union City, N. J.
Leatherine	Box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Leedpak	Converted products, fabricated containers	Leeds Sales Co. Inc., New York, N. Y.
Lenonet	Open-mesh bags	Bemis Bro. Bag Co., St. Louis, Mo.
Lenox Gold	Gold and platinum box coverings	McLaurin-Jones Co., Brookfield, Mass.
Leonlite	Electric sign	Leon S. Berkowitz, Phila., Pa.
Lepaco	Moisture and greaseproof board	Lebanon Paper Box Co., Lebanon, Pa.
Lesco	Unconverted paper products	Leeds Sales Co. Inc., New York, N. Y.
Lestoil	Detergent	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Lev-A-Lift	Opening device for friction plug containers	The Lev-A-Lift Co., New York, N. Y.
Levelbest	Containers, shipping	Fibreboard Products, Inc., San Francisco, Calif.
Leverpak	Fibre shipping drum	The Container Co., Div. Continental Can Co., Inc., Van Wert, Ohio
Liftab	Milk bottle caps	Sealright Co., Inc., Fulton, N. Y.
Liftright	Milk bottle caps	Sealright Co., Inc., Fulton, N. Y.
Lightning	Coated box coverings	McLaurin-Jones Co., Brookfield, Mass.
Lightning Seal	Bread wrappers	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.

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TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Likwid Proof Black	Inks	Chemical Color & Supply Div., Sun Chemical Corp., Chicago, Ill.
Lilipack	Paper flour bags	Chase Bag Co., Chicago, Ill.
Lily White	Box covering paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Linco	Belt conveyor	Karl Kiefer Machine Co., Cincinnati, Ohio
Link-Belt	Elevating, conveying and power transmission equipment	Link-Belt Co., Chicago, Ill.
Lin-oli-ink	Printing ink, water color	The Braden Sutphin Ink Co., Cleveland, Ohio
Lion	Adhesives	Manhattan Paste & Glue Co., Inc., Bklyn, N. Y.
Liquid	Labeling machines and accessories	The Liquid Carbonic Corp., Chicago, Ill.
Liquid Film	Laminations of two or more transparent membranes	Shellmar Products Corp., Mt. Vernon, Ohio
Liquid Plating	A lamination substitute	Mor-Gan Laminating & Foilating Co., New York, N. Y.
Liquid Single	Labeling machines	The Liquid Carbonic Corp., Chicago, Ill.
Liquipak	Fibre shipping drum	The Container Co., Div. Continental Can Co., Inc., Van Wert, Ohio
Liqui-Wash	Industrial workers' hand soap	Paisley Products, Inc., Chicago, Ill.
Listette	Box paper	Kupfer Bros. Co., New York, N. Y.
Lithalum	Metallic finish inks	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Lithochrome	Synthetic varnish to protect metal against corrosive agents	Ault & Wiborg, Div. Interchemical Corp., New York, N. Y.
Lithopaque	Printing process	The Dobeckmun Co., Cleveland, Ohio
Lithotine	Turpentine substitute	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Lithox	Lithographic inks	International Printing Ink, Div. Interchemical Corp, New York, N. Y.
Lithwite	White uncoated boxboard	The Gardner-Richardson Co., Middletown, Ohio
Little Inch	Measuring dispenser for pressure sensitive tape	Better Packages, Inc., Shelton, Conn.
Loabond	Styrene laminating	Catalin Corp., New York, N. Y.
Loalin	Polystyrene molding compound	Catalin Corp., New York, N. Y.
Loevar	Styrene surface coating	Catalin Corp., New York, N. Y.
Lockerap	Frozen food locker paper	Western Waxed Paper Co., Los Angeles, Calif.
Lock-Tite	Dress box	American Box Board Co., Grand Rapids, Mich.
Lock Top	Screw top can with locking lugs	Continental Can Co., New York, N. Y.
Locktop	Paper ice cream can	National Folding Box Co., New Haven, Conn.
Locktop	Paper cans	Morris Paper Mills, Chicago, Ill.
Loftee Cotton	Filler for jewelry boxes	Union Wadding Co., Pawtucket, R. I.
Lok-Rim	Fibre shipping drum	Carpenter Container Corp., Bklyn, N. Y.
Lokseal	Waxed papers	The Specialty Papers Co., Dayton, Ohio
Loksure	Meat paper for lockers	The Specialty Papers Co., Dayton, Ohio
Lookit	Set-up and acetate boxes	Flower City Specialty Co., Rochester, N. Y.
Loomlite	Textile box papers	Hazen Paper Co., Holyoke, Mass.
Lotol	Processed and compounded liquid latex	U. S. Rubber Co., New York, N. Y.
Low Pressure	Bottle fillers	The Liquid Carbonic Corp., Chicago, Ill.
LoxTite	Partition for packaging candy, cookies, beverages, eggs, fragile commodities, etc.	Traver Corp., Chicago, Ill.
Lucite	Methyl methacrylate resin	E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Lumarith C.A.	Cellulose acetate sheets, rods, tubes, films, foils	Celanese Plastics Corp., New York, N. Y.
Lumarith E.C.	Ethyl cellulose films and molding materials	Celanese Plastics Corp., New York, N. Y.
Lumarith V.N.	Vinyl chloride acetate films and foils	Celanese Plastics Corp., New York, N. Y.
Lumarith X	High acetyl cellulose acetate molding material	Celanese Plastics Corp., New York, N. Y.
Lumlite	Aluminum powder coated sheet, silver and gold	Louis Dejonge & Co., New York, N. Y.
Lustaseel	Sulphite paper	Newark Paraffine & Parchment Paper Co., Newark, N. J.
Lusteroid	Plastic containers, vials and tubes	Lusteroid Container Co., Inc., South Orange, N. J.
Lustr-Cote	Gloss printing inks	Eagle Printing Ink Co., Div. General Printing Ink Co., New York, N. Y.
Lustre Chintz	Printed, embossed, mica coated box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Lustre-Print	High gloss printed labels and seals	Dennison Mfg. Co., Framingham, Mass.
Lustrette	Box paper	Kupfer Bros. Co., New York, N. Y.
Lustro	Aniline printing process	Milprint, Inc., Milwaukee, Wis.
Lustrofoil	Marking foil	Peerless Roll Leaf Co., Inc., Union City, N. J.
Lustron	Polystyrene molding compound	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Lustron	Wrapping paper	Hartford City Paper Co., Hartford City, Ind.
Lustseal	Closure	Owens-Illinois Glass Co., Toledo, Ohio
Lux-Lite	Displays with flashers	Reynolds Metals Co., Richmond, Va.
Luxor Gold	Gold box covering	McLaurin-Jones Co., Brookfield, Mass.
Luxorline	Box cover paper	Matthias Paper Corp., Phila., Pa.
Lyonsdale	Tissue paper	Moyer & Pratt, Inc., Lyons Falls, N. Y.
M. L. S.	Mucilage	Paisley Products, Inc., Chicago Ill.
"MRK" Resinoid	Caster and truck wheels	The Rapids-Standard Co., Inc., Grand Rapids, Mich.
M.R.M.	Semi-automatic vacuum filler	M.R.M. Co., New York, N. Y.
M & S	Fillers for cans and jars, etc.	Food Machinery Corp., Hoopeston, Ill.
M-V-Bar	Impregnated and coated moisture vapor barrier fabric	Protective Coatings Corp., Belleville, N. J.
Made-Rite	Mailing boxes	F. H. Buffinton Co., Providence, R. I.
Mailmaster	Mailing box	The Mason Box Co., Attleboro Falls, Mass.
Mainstay	Cotton twine for hand sewing bag closures	Bemis Bro. Bag Co., St. Louis, Mo.
Major	Automatic printing press	Miller Printing Machinery Co., Pittsburgh, Pa.
Makalot	Phenol-formaldehyde molding compounds and resins	Interlake Chemical Corp., Cleveland, Ohio
Mallefold	Malleable crease display material	Waldorf Paper Products Co., St. Paul, Minn.
Mamco	Counters	Maxson Automatic Machinery Co., Westerly, R. I.
Manhattan	Paper food containers	Stevens & Thompson Paper Co., Greenwich, N. Y.
Maralux	Bags for hygroscopic products	Marathon Corp., Menasha, Wis.
Marapak	Bags and liners for frozen food packages	Marathon Corp., Menasha, Wis.
Marble-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Marblette	Phenol-formaldehyde cast and liquid resins	Marblette Corp., Long Island City, N. Y.
Marco	Leather grain paper	The Marvellum Co., Holyoke, Mass.
Markem	Printing machines	Markem Machine Co., Keene, N. H.
Market Paper	Meat wrapping paper	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Markomatic	Marking machines, marking attachments	Adolph Gottscho, Inc., New York, N. Y.
Marsh	Stencil cutting machine	Marsh Stencil Machine Co., Belleville, Ill.
Mason Pak	Double bottom fold bag with elliptical opening	Mason Envelope Co., Inc., New York, N. Y.
Master	Infolding diagonal gluing machine	E. G. Staude Mfg. Co., St. Paul, Minn.
Master, The	Fibre shipping drums and pails	The Master Package Corp., Owen, Wis.
Masterbuilt	Set-up paper candy boxes	F. J. Schleicher Paper Box Co., St. Louis, Mo.
Mastercraft	Line of products	Ben Mont Papers, Inc., Bennington, Vt.
Mastercraft	Leatherette boxes and displays	Harlich Mfg. Co., Mastercraft Div., Chicago, Ill.
Master Freezerwrap	Meat packer wrappers	H. P. Smith Paper Co., Chicago, Ill.
Master Mailers	Mailing cartons	Calumet Carton Co., Harvey, Ill.
Master Prints	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Master Ray	Metal surfaced counter and window displays	Reynolds Metals Co., Richmond, Va.
Masterwrap	Interfolded waxed tissue	Rhinelander Paper Co., Rhinelander, Wis.
Matador	Paper bag machines	H. H. Heinrich, Inc., New York, N. Y.
Mat-A-Labels	Metal labels	L. F. Grammes & Sons, Inc., Allentown, Pa.
Match-Box	Kit for matching colors	International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Mayflower	Paper drinking cups	American Paper Goods Co., Kensington, Conn.
Mayplex	Sandwich wrapper	Wright's Automatic Machinery Co., Durham, N. C.
Mazein	Soluble extract of the protein in corn	Corn Products Refining Co., New York, N. Y.
Measure Scoop	Bag filling device	Milprint, Inc., Milwaukee, Wis.
Meatpak	Greaseproof labels and inserts for meat products	Tompkins' Label Service, Phila., Pa.
Medallion	Specialty wrapping paper	Yorkville Paper Co., Inc., New York, N. Y.
Megatherm	High-frequency electronic sterilization equipment	Federal Telephone & Radio Corp., Newark, N. J.
Melco	Decorated metal containers	Seymour Products Co., Seymour, Conn.
Melmac	Melamine-formaldehyde molding material and adhesives	American Cyanamid Co., Plastics Div., New York, N. Y.
Melody Print	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Melurac	Melamine—urea formaldehyde molding compound, resin adhesive and resins	American Cyanamid Co., Plastics Div., New York, N. Y.
Membranate	Greaseproof heat-sealing paper	S. D. Warren Co., Boston, Mass.
Menasha	Paraffined cartons and papers	Marathon Corp., Menasha, Wis.
Mercury	Closure	Owens-Illinois Glass Co., Toledo, Ohio

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TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Mercury	Carton gluer	E. G. Staude Mfg. Co., St. Paul, Minn.
Mercury	Vignette for labels	The U. S. Printing & Lithograph Co., Cincinnati (Norwood), Ohio
Mercury-Slicewrap	Combination bread slicing and wrapping machine	Oliver Machinery Co., Grand Rapids, Mich.
Meritseal	Metal closures	Crown Cork & Seal Co., Inc., Baltimore, Md.
Meshtex	Fluted paper cemented to cotton web, for wrapping and concrete curing mats	Fulton Bag & Cotton Mills, Atlanta, Ga.
Metacel	Metal foil tape	Industrial Tape Corp., New Brunswick, N. J.
Met-A-Labels	Metal labels	L. F. Grammes & Sons, Inc., Allentown, Pa.
Met-A-Lac	Imitation foil	Paper Affiliates, Dept. Nalco, Inc., New York, N. Y.
Metal-Art	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Metal Art Plaid	Box cover paper	Holyoke Card & Paper Co., Springfield, Mass.
Metal Edge	Reinforced paper boxes	National Metal Edge Box Co., Phila., Pa.
Metaliflex	Flexible hot glue	National Adhesives, New York, N. Y.
Metalglass	Metallic coated glassine	Hartford City Paper Co., Hartford City, Ind.
Metalhue	Colored metallic box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Metaline	Printed embossed paper	Hampden Glazed Paper & Card Co., Inc., Holyoke, Mass.
Metal Lac	Metal printed and embossed friction glazed papers and boards	Keller-Dorian Corp., New York, N. Y.
Metallic	Pyroxylin coated metallic papers	Hazen Paper Co., Holyoke, Mass.
Metaloid	Embossed signs and boxes and plaques	Chaspec Mfg. Co., Inc., New York, N. Y
Metaloid	Pyroxylin coated paper	The Plastic Coating Corp., Holyoke, Mass.
Metalour	Gold and silver papers	The Marvellum Co., Holyoke, Mass.
Metal Seal	Foil and imitation foil	Bradner Smith & Co., Chicago, Ill.
Metalite	Flat gummed paper	The Gummed Products Co., Troy, Ohio
Metaltone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Metalustre	Metallic lacquer enamels	Maas & Waldstein Co., Newark, N. J.
Metex	Gold or silver cellulose acetate	E. L. Cournand, Inc., New York, N. Y.
Methocel	Methyl cellulose	The Dow Chemical Co., Midland, Mich.
Metlak	Metallic inks	Pope & Gray, Inc., New York, N. Y.
Metso	Cleansers	Philadelphia Quartz Co., Phila., Pa.
Mezzotint	Printed and embossed metallic coated papers and boards	Keller-Dorian Corp., New York, N. Y.
Mic	Molded plastics	Molded Insulation Co., Phila., Pa.
Micacrystal	Crinkled cellophane	Aldine Paper Co., New York, N. Y.
Michcote	Super white boxboard	Michigan Carton Co., Battle Creek, Mich.
Midget	Wire staples	Acme Staple Co., Camden, N. J.
Midget	Labeling machines and accessories	The Liquid Carbonic Corp., Chicago, Ill.
Midget	Static eliminator	The Simco Co., Phila., Pa.
Mikah	Glues, pastes, gums and lacquers	National Adhesives, New York, N. Y.
Milbossed	Embossed wood top corks	Dodge Cork Co., Inc., Lancaster, Pa.
Milgate	Thermoplastic or heat seal label paper	E. W. Twitchell, Inc., Packaging Div., Phila., Pa.
Millbridge	General	Springfield Coated Paper Corp., Camden, N. J.
Miller	Package and bundle wrapping machines	Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Millsplastic	Extruded Saran	Elmer E. Mills Corp., Chicago, Ill.
Mil-O-Bands	Thermoplastic sausage bands	Milprint Inc., Milwaukee, Wis.
Mil-O-Seal	Pliofilm sheet for encasing cooked food	Milprint Inc., Milwaukee, Wis.
Milparch	Greaseproof parchment paper, grease resistant	Miller & Miller, Atlanta, Ga.
Milwaukee	Aniline printing press and bronzing machines	C. B. Henschel Mfg. Co., Milwaukee, Wis.
Minc	Plate and fountain edges	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Minette	Box paper	Kupfer Bros. Co., New York, N. Y.
Miro-Cups	Hot and cold cups for liquids	Miro Container Co., Inc., Brooklyn, N. Y.
Mirofoil	Imitation foil papers	Marvellum Co., Holyoke, Mass.
Mirolite	Transparent thermoplastic papers	Newark Paraffine & Parchment Paper Co., Newark, N. J.
Mirodescent	Box papers	Hazen Paper Co., Holyoke, Mass.
Miroflex	Flexible hot glue	National Adhesives, New York, N. Y.
Mirror Flints	Glazed flint	Louis Dejonge & Co., New York, N. Y.
Mistion	Gift ribbons and wrappings	Minnesota Mining & Mfg. Co., St. Paul, Minn.
Modern Clipper	Automatic bag-making machine	Modern Containers, Inc., Los Angeles, Calif.
Modern Union	Metal displays	Union Steel Products Co., Albion, Mich.
Moderne Dull Antique	Clay coated paper	Bradner Smith & Co., Chicago, Ill.
Moistite	Moisture resistant boxboard	Waldorf Paper Products Co., St. Paul, Minn.
Moist Pruf	Set-up paper cigar boxes	Consolidated Box Co., Inc., Tampa, Fla.
Moist-R-Proof	Bags, tubes, liners, molded fibre shipping containers	Moist-R-Proof Container Co., San Francisco, Calif.
Molloy-Made	Imitation leather containers	The S. K. Smith Co., Chicago, Ill.
Monarch	Fillers	The Liquid Carbonic Corp., Chicago, Ill.
Monarch	Right angle folding box gluer	E. G. Staude Mfg. Co., St. Paul, Minn.
Monocell	Filter	Karl Kiefer Machine Co., Cincinnati, Ohio
Monitor	Concealed lug caps	Anchor Hocking Glass Corp., Lancaster, Ohio
Monograved	Labels	The United States Printing & Litho. Co., Cincinnati, Ohio
Mono Kleen Kups	Paraffined containers	Mono Service Co., Newark, N. J.
Mono-Pak	Collapsible tubes for single use	A. H. Wirz, Inc., Chester, Pa.
Mono-Piston	Filling machine for viscous materials	Karl Kiefer Machine Co., Cincinnati, Ohio
Monoscale	Can filling machine	Karl Kiefer Machine Co., Cincinnati, Ohio
Mono Spout	Spout fitting	Continental Can Co., New York, N. Y.
Monotite	Laminated paper	Nashua Gummed & Coated Paper Co., Nashua, N. H.
Morpac	Butter print forming, wrapping and cartoning machine	Lynch Mfg. Corp., Defiance, Ohio
Morr-Glos	Gloss ink	Geo. H. Morrill Div., Sun Chemical Corp., New York, N. Y.
Morris	Box closing lock	Robertson Paper Box Co., Inc., Montville, Conn.
Morrison	Wire stitchers	Harris - Seybold Co., Cleveland, Ohio
Morrow-Stevens	Wrapping and sealing machines	Maxson Automatic Machinery Co., Westerly, R. I.
Mosaic Parquetry	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Moto-Air	Vacuum and pressure pump	New Jersey Machine Corp., Hoboken, N. J.
Mullinix	Greaseproof packages	Western Waxed Paper Co., Los Angeles, Calif.
Multi	Process inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Multistamp	Stencil duplicators	The Multistamp Co., Inc., Norfolk, Va.
Multitite	Scratch proof inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Multitone	Halftone inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Multiwax	Petroleum wax	Petroleum Specialties, Inc., New York, N. Y.
Mural	Fancy waterproof box paper	The Marvellum Co., Holyoke, Mass.
Myers Labelstik	Seamless metal boxes	George D. Ellis & Sons, Inc., Myers Mfg. Div., Phila., Pa.
Myracol	Cartons	Container Corp. of America, Chicago, Ill.
Nafomatic	Folding paper box	National Folding Box Co., New Haven, Conn.
Nanking	Chinese papers	Stevens, Nelson Paper Corp., New York, N. Y.
Napcones	Displays	The National Process Co., New York, N. Y.
Napconstruction	Unmounted displays	The National Process Co., New York, N. Y.
Nap grippe	Displays	The National Process Co., New York, N. Y.
Nalco	Asphalt laminated paper	National Water-Proofing Co., Camden, N. J.
National	Labeling machines and accessories	The Liquid Carbonic Corp., Chicago, Ill.
National	Adhesives (all types)	National Adhesives, New York, N. Y.
National	Metal bags for food products	Reynolds Metals Co., Richmond, Va.
National	Packaging machinery	U. S. Automatic Box Machinery Co., Inc., Roslindale, Boston, Mass.
National Sealer	Tape moistening machine	Nashua Package Sealing Co., Inc., Nashua, N. H.
National Tay-Per	Tape moistening machine	Nashua Package Sealing Co., Inc., Nashua, N. H.
Naugahyde	Artificial leather	United States Rubber Co., New York, N. Y.
Naxsheen	Special coated glassine	Dixie Wax Paper Co., Dallas, Texas
Needlekraft	Paper for box coverings	Pejepscot Paper Co., New York, N. Y.
Neillite	Phenol-formaldehyde molding powder	The Watertown Mfg. Co., Watertown, Conn.
Neocell	Cellulose vials, containers and specialties	Celluplastic Corp., Newark, N. J.
Neo-Classic	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Nestcup	Nesting container	Sutherland Paper Co., Kalamazoo, Mich.
Nestrite	Heavy-duty round nested paper container	Lily-Tulip Cup Corp., New York, N. Y.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Nestyle	Nested type container	The Sealright Co., Inc., Fulton, N. Y.
Neutraglas	Chemically resistant glass in ampuls, vials and serum bottles	Kimble Glass Co., Vineland, N. J.
Neverstop	Carton filling and sealing machine	Stokes & Smith Co., Phila., Pa.
Newman Seal	Circular compounded crimped closure	Continental Can Co., New York, N. Y.
New Perfection	Dropper bottles and parts	Pennsylvania Glass Products Co., Pittsburgh, Pa.
New-Way	Line of labelers, casers and unscramblers	Chisholm-Ryder Co. of Pa., Hanover, Pa.
Niagara Wire Stitcher	Wire stitching and stapling machine	Paslode Co., Chicago, Ill.
Nicro-Steel	Casters	The Rapids-Standard Co., Inc., Grand Rapids, Mich.
Niles	Shipping containers, metal drums	Republic Steel Corp., Cleveland, Ohio
Nitron	Cellulose nitrate	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Nixonite	Cellulose acetate (sheets, rods and tubes)	Nixon Nitration Works, Nixon, N. J.
Nixonite M.P.	Cellulose acetate molding powder	Nixon Nitration Works, Nixon, N. J.
Nixonoid	Cellulose nitrate (pyroxylin)	Nixon Nitration Works, Nixon, N. J.
No-Drip	Plastic serving closure	Federal Tool Corp., Chicago, Ill.
Nojax	Cellulose meat casings	The Visking Corp., Chicago, Ill.
No-Kap	Collapsible tubes	National Collapsible Tube Co., Providence, R. I.
No-Kap	Closures	No-Kap Closures (U.S.A.), Inc., Providence, R. I.
No-Lap	Abrasive bands and sleeves	The Cleveland Container Co., Cleveland, Ohio
Nolox	Knock-down paper box	American Box Board Co., Grand Rapids, Mich.
No-Lox	Folding carton	Robert Gair Co., Inc., New York, N. Y.
Nolox	Garment boxes	Morris Paper Mills, Chicago, Ill.
No-Lox	Special automatic quick set folding boxes	Pollock Paper & Box Co., Dallas, Texas.
Nolox	Double corner folding boxes	Spear Box Co., Inc., New York. N. Y.
Non-Scratch	Printing inks	The Braden Sutphin Ink Co., Cleveland, Ohio
Non-Scuff	Liner board on corrugated boxes	F. J. Kress Box Co., Pittsburgh, Pa.
Non-Warp Glue	Flexible hot glue	National Adhesives, New York, N. Y.
Norbutus	Pyroxylin coated metallic papers in brilliant colors	Hazen Paper Co., Holyoke, Mass.
Nordoc	Molded plastic packages	Norton Laboratories, Inc., Lockport, N. Y.
No Sol Vit	Alkali free serum containers	T. C. Wheaton Co., Millville, N. J.
No Tarnish	Metal tarnish preventative	Cleaveland Lab. & Mfg. Co. Inc., Peapack, N. J.
Novar	Decalcomania label	Palm, Fechteler & Co., New York, N. Y.
Nox-Rust	Rust preventive coatings	Nox-Rust Chemical Corp., Chicago, Ill.
Nub-Linen	Fancy printed	Louis Dejonge & Co., New York, N. Y.
Nu-Craft	Display, corrugated	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Nu-Curve	Corrugated display material	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Nugget	Cover paper	United Mfg. Co., Springfield, Mass.
Nu-Glas	Glass tumblers, jars and bottles	Anchor Hocking Glass Corp., Lancaster, Ohio
NuGlaze	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Nu-Hide	Box cover paper	Matthias Paper Corp., Phila., Pa.
NuMat	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Nu-Trim	Corrugated display material	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Nuvohack	Folding paper box	Everett Young Co., Providence, R. I.
Nuvopak	Preformed and prewrapped collapsible containers	Cambridge Paper Box Co., Cambridge, Mass.
O. & J.	Labeling machines and accessories	Liquid Carbonic Corp., Chicago, Ill.
Obaco	Folding paper box	National Folding Box Co., New Haven, Conn.
Oiltex	Facsimile oil paintings	Chaspec Mfg. Co., New York, N. Y.
Old Fashioned	Square style grocery bags	Consolidated Paper Bag Co., Somerville, Mass.
Old Tavern	Gold and platinum box coverings	McLaurin-Jones Co., Brookfield, Mass.
Oldelace	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Oliver	Wrapping and labelling equipment	Oliver Machinery Co., Grand Rapids, Mich.
One-A-Time	Pill dispensing box	National Folding Box Co., New Haven, Conn.
1-Way	No deposit, no return beer bottles	Anchor Hocking Glass Corp., Lancaster, Ohio
Onixed	Containers	Owens-Illinois Glass Co., Toledo, Ohio
On-to-sta	Gummed tapes and cambrics	Atlantic Gummed Paper Corp., Bklyn, N. Y.
Opal	Kraft grocery bags	Consolidated Paper Bag Co., Somerville, Mass.
Opalescent	Embossed iridescent box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Opalite	Cast phenolic semi-transparent	Catalin Corp., New York, N. Y.
Opalon	Cast phenolic plastics	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Opti-Check	Color plate registering device	H. H. Heinrich Inc., New York, N. Y.
Orientone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Oriole	Cold water paste	Stein, Hall & Co., Inc., New York, N. Y.
Orpco	Corrugated boxes and displays	Ottawa River Paper Co., Toledo, Ohio
Outserts	Package advertising for the outside of containers	Outserts, Inc., New York, N. Y.
Overseal	Roll-on tamperproof over screw top	Aluminum Seal Co., New Kensington, Pa.
Owens	Druggists glassware	Owens-Illinois Glass Co., Toledo, Ohio
PV Film	Polyvinyl alcohol film	E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Pacemaker	Gumming machine	New Jersey Machine Corp., Hoboken, N. J.
Pacer	Bag and envelope heat sealing devices	Heat Seal-It Co., Phila., Pa.
Packer	Sealing tape machine	Better Packages, Inc., Shelton, Conn.
Packers' Pal	Roll corrugated and paper dispenser	Abana Products, Chicago, Ill.
Packette	Household paper bags	Newark Glassine Bag Co., Newark, N. J.
Packette	Utility bags	Newark Paraffine & Parchment Paper Co., Newark, N. J.
Packomatic	Packaging machinery	J. L. Ferguson Co., Joliet, Ill.
Packomatic Chief	6-in-line net wt. scale	J. L. Ferguson Co., Joliet, Ill.
Packrette	Box paper	Kupfer Bros. Co., New York, N. Y.
Pack-Rite	Heat-sealers	Pack-Rite Machines, Milwaukee, Wis.
Pac-Kups	Paper containers	Dixie Cup Co., Easton, Pa.
Paco-Lac	Pyroxylin coated paper	Paper Affiliates, Dept. Nalco, Inc., New York, N. Y.
Pac-Pruf	Water- and oil-proof papers	Cromwell Paper Co., Chicago, Ill.
Pacquette	Cellophane bag	Thomas M. Royal & Co., Phila., Pa.
Padinol	Flexible adhesive	The Fales Chemical Co., Inc., Cornwall Landing, N. Y.
Padocel	Protective wadding	Geo. H. Sweetnam, Inc., Cambridge, Mass.
Padox	Box top padding	Union Wadding Co., Pawtucket, R. I.
Padsit	Padding paper	Geo. H. Sweetnam, Inc., Cambridge, Mass.
Pads-It	Cold process padding gum	The Commercial Paste Co., Columbus, Ohio
Pais-Flex	Flexible adhesives	Paisley Products, Inc., Chicago, Ill.
Paisley	General line adhesives	Paisley Products, Inc., Chicago, Ill.
Paisley Spray	Solution for non-offset spray guns	Paisley Products, Inc., Chicago, Ill.
Paisol	Envelope gum additive	Paisley Products, Inc., Chicago, Ill.
Paistex	Latex cements	Paisley Products, Inc., Chicago, Ill.
Paistic	Cook-up paste powder	Paisley Products, Inc., Chicago, Ill.
Paistick	White office paste	Paisley Products, Inc., Chicago, Ill.
Paker Bulkan	For bulk shipments, up to 30 lbs.	The Sealright Co., Inc., Fulton, N. Y.
Pakerkan	Frozen foods container (bulk)	The Sealright Co., Inc., Fulton, N. Y.
Pak King	Filling machine	Weigh Right Automatic Scale Co., Joliet, Ill.
Pak-Saks	Frozen and dehydrated food containers	Thomas M. Royal & Co., Phila., Pa.
Pak-Save	Frozen food locker paper	E. W. Twitchell, Inc., Pkg. Div., Phila., Pa.
Paktite	Light-duty pleated round nested paper container	Lily-Tulip Cup Corp., New York, N. Y.
Pak Vue	Double bottom fold bag with flap for food packaging	Mason Envelope Co., Inc., New York, N. Y.
Palmetto	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Palmlac	Window display signs	The Palm Bros. Decalcomania Co., Cincinnati, Ohio
Panaseal	Laminated paper liner	General Felt Products, Inc., Bklyn, N. Y.
Papersios	Glassine paper	Westfield River Paper Co., Russell, Mass.
Papricloth	Treated parchment	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Parafane	Super-transparent, glassine, lacquered paper	Paramount Paper Products Co., Inc., Phila., Pa.
Paragon	Two-piece caps	Anchor Hocking Glass Corp., Lancaster, Ohio
Paragon	Hand numbering machines	Wm. A. Force & Co., Inc., Bklyn, N. Y.
Parakote	Moistureproof coated packaging papers	Marathon Corp., Menasha, Wis.
Paramount	General	Paramount Paper Products Co., Inc., Phila., Pa.
Paraply	Moistureproof and greaseproof laminated cartons	Marathon Corp., Menasha, Wis.
Para-Shield	Thermoplastic coatings for bottle sealing	Paragon Plastics, Inc., Seattle, Wash.
Paraval	Laminated glassine	The Glassine Paper Co., West Conshohocken, Pa.
Para-Ware	Plastic containers and tableware	Paragon Plastics, Inc., Seattle, Wash.

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Parawax	Preprint waxed bags	Paramount Paper Products Co., Inc., Phila., Pa.
Parchkin	Vegetable parchment for art printing	Paterson Parchment Paper Co., Bristol, Pa.
Parch Kraft	Paper and products	Harvey Paper Products, Sturgis, Mich.
Parchstone	Greaseproof innerwrap	Rhinelander Paper Co., Rhinelander, Wis.
Parkay	Woodgrain box papers	Hazen Paper Co., Holyoke, Mass.
Parkwood	Impregnated wood plastic material	Parkwood Corp., Wakefield, Mass.
Parquet	Wood grain (imitation) box covers	District of Columbia Paper Mills, Inc., Washington, D. C.
Parquette	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Parry	Paper box machinery	Samuel R. Parry Mach. Co., Inc., Rochester, N. Y.
Pastel Creations	Paper for box coverings	Pejepscot Paper Co., New York, N. Y.
Patapake	White paper for printing and packaging	Paterson Parchment Paper Co., Bristol, Pa.
Patapar	Genuine vegetable parchment	Paterson Parchment Paper Co., Bristol, Pa.
Patawite	A 9-lb manifold	Paterson Parchment Paper Co., Bristol, Pa
Patax	Waxed paper	Paterson Parchment Paper Co., Bristol, Pa.
Pax-Dry-Seal	Pressure sensitive tapes	The Cofax Corp., Lynbrook, N. Y.
Paxwell	Padding	American Lace Paper Co., Milwaukee, Wis.
Peabody	Paper screw cap	Keith-Peabody, Inc., Brookline, Mass.
Peak-O-Net	Cotton bags	American National Bag & Burlap Co., Inc., Bklyn, N. Y.
Pearl	Micro-crystalline wax	Petrolite Corp., Wax Div., New York, N. Y.
Pedigree	Line of protective coatings	The P. D. George Co., St. Louis, Mo.
Pee Gee	Reducing and non-scratch ink compounds	Pope & Gray, Inc., New York, N. Y.
Peel-Pail	Ice cream pail	Bloomer Bros. Co., Newark, New York State
Peerless	Stamping presses, roll leaf	Peerless Roll Leaf Co., Inc., Union City, N. J.
Peerless	Infolding gluing machine	E. G. Staude Mfg. Co., St. Paul, Minn.
Peerless	Straight line vacuum fillers	U. S. Bottlers Machinery Co., Chicago, Ill.
Pellette	Box paper	Kupfer Bros. Co., New York, N. Y
Penargette	Box paper	Kupfer Bros. Co., New York.
Penescope	Penetration tester	Thwing-Albert Instrument Co., Phila., Pa.
Penetron	Moistening agent for tape machines	Better Packages, Inc., Shelton, Conn.
Perfect Circle Plates	Engravings	Champlain Co., Inc., New York, N. Y.
Perfection	Gummed, heat sealing and strip gummed papers	Paper Manufacturers Co., Phila., Pa.
Perfection	Medicine droppers, vials and wide mouth jars	Pennsylvania Glass Products Corp., Pittsburgh, Pa.
Perfection	Box cover papers	Royal Paper Corp., New York, N. Y.
Perfect-O-Cut	Embossed labels, seals, cards and dials	The Tablet & Ticket Co., Chicago, Ill.
Perfecto-Pac	Pie bands	Milprint, Inc., Milwaukee, Wis.
Permacel	Paper and cloth tape	Industrial Tape Corp., New Brunswick, N. J.
Permaflex	Glue	The F. G. Findley Co., Milwaukee, Wis.
Permalene	Pigmented aniline inks	Hill-Hentschel Co., St. Louis, Mo.
Perma-Seal-Opaque	Self sealing opaque bread wrappers	Pollock Paper & Box Co., Dallas, Texas
Perma-Shed	Water-shedding paper	S. D. Warren Co., Boston, Mass.
Perma-Stic	Dextrine label gum	National Adhesives, New York, N. Y.
Permolene	Pigmented aniline inks	Hill-Hentschel Co., St. Louis, Mo.
Petite Moire	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Petrocote	Asphalt coated paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Phantom	Embossed box papers	Hazen Paper Co., Holyoke, Mass.
Phantom-Lite	Displays with flashers	Reynolds Metals Co., Richmond, Va.
Phen-Cote	Can liner coating	Watson-Standard Co., Pittsburgh, Pa.
Phenix	Glass bottles	Armstrong Cork Co., Lancaster, Pa.
Phoenix	Band cap; cone top can	Phoenix Metal Cap Co., Chicago, Ill.
Photomailer	Mailing envelopes	Hinde & Dauch Paper Co., Sandusky, Ohio
Pick-ets	Uniform pellets of hot pick-up glue	The F. G. Findley Co., Milwaukee, Wis.
Pie-Pak	Container for pies	Pie-Pak Co., Inc., Hoboken, N. J.
Pier forms	Paper and fibre tubes	Beacon Container Co., New York, N. Y.
Pilferproof	Roll-on bottle closure	Aluminum Seal Co., New Kensington, Pa.
Pinko	Saturating paper	Hummel-Ross Fibre Corp., Hopewell, Va.
Pin Stripes	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Pintex	Printed box paper	The Marvellum Co., Holyoke, Mass.
Pique	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Pique Embossed	Box cover paper	Holyoke Card & Paper Co., Springfield, Mass.
Plaid Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
PlainLid	Ointment boxes	Columbia Specialty Co., Inc., Baltimore, Md.
Planet	Sealing tapes	McLaurin-Jones Co., Brookfield, Mass.
Plaskon	Urea and melamine molding compounds and resins	Plaskon Div., Libbey-Owens-Ford Glass Co., Toledo, Ohio
Plastacele	Cellulose acetate sheeting and molding powder	E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Plastak	Color printed and embossed friction glazed papers and boards	Keller-Dorian Corp., New York, N. Y.
Plasticap	Molded caps	Anchor Hocking Glass Corp., Lancaster, Ohio
Plastic Basket	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Plasticoid	Vinyl chloride transparent covers	Clarvan Corp., Milwaukee, Wis.
Plasticolor	Cellulose laminated cover paper	The Dobeckmun Co., Cleveland, Ohio
Plastifibre	Plastic impregnated tubes	Cambridge Paper Box Co., Cambridge, Mass.
Plastik Foil	Roll leaf for plastics	Peerless Roll Leaf Co., Union City, N. J.
Plastin	Heat sealed bags, barriers and liners	Plastic Film Corp., Plainfield, Conn.
Plastipak	Non-corrosive, greaseproof, heat-sealing paper	S. D. Warren Co., Boston, Mass.
Plastipeel	Hot dip, strippable plastics	Protective Coatings Corp., Belleville, N. J.
Plast-O-Dip	Heating and dipping tank for strip coating	Aeroil Burner Co., W. New York, N. J.
Plateglassine	Bleached glassine	Deerfield Glassine Co., Monroe Bridge, Mass.
Pletelustre	Transparent colored lacquers	Maas & Waldstein Co., Newark, N. J.
Plexiglas	Transparent acrylic plastic sheets and molding compounds	Rohm & Haas Co., Phila., Pa.
Plia	Comoining gum for fabrics	Stein, Hall & Co., Inc., New York, N. Y.
Pliastic	Synthetic resin emulsion adhesives	Paisley Products, Inc., Chicago, Ill.
Pliatab	Padding, bookbinding adhesive	Paisley Products, Inc., Chicago, Ill.
Pli-Cote	Metal coater	Watson-Standard Co., Pittsburgh, Pa.
Pli-Fast	Sealing tapes	Rexford Paper Co., Milwaukee, Wis.
Plio	Pliofilm ribbon	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Pliobond	Synthetic resin adhesives	The Goodyear Tire & Rubber Co., Akron, Ohio
Pliofilm	Transparent rubber-hydrochloride film	The Goodyear Tire & Rubber Co., Akron, Ohio
Plioflex	Hot flexible glue	Arvey Corp., Chicago, Ill.
Pliolite	Liquid protective coating	The Goodyear Tire & Rubber Co., Akron, Ohio
Plio-Ribbon	Printed pliofilm ribbon	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Pliosuede	Velour pliofilm	Cellusuede Products, Inc., Rockford, Ill.
Plio-Tye	Plastic coated material made of pliofilm	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Pliowax	Hot melt coatings	The Goodyear Tire & Rubber Co., Akron, Ohio
Plushtex	Rayon velour flock paper	Kaplan Products and Textiles, Inc., New York, N. Y.
Plyglass	Multi-ply laminated glassine	Deerfield Glassine Co., Monroe Bridge, Mass.
Ply-Metal	Foil containers	Reynolds Metals Co., Richmond, Va.
Plymouth	Paper drinking cups	The American Paper Goods Co., Kensington, Conn.
Pocono	Box cover paper	Matthias Paper Corp., Phila., Pa.
Polarflex	Frozen food base papers	S. D. Warren Co., Boston, Mass.
Polymerin	Speed-bake enamel finish	Ault & Wiborg, Div. Interchemical Corp., New York, N. Y.
Polymex	Baking enamel for low temperature treatment	Ault & Wiborg Div., Interchemical Corp., New York, N. Y.
Pomona	Fruit and vegetable wrappers (tissue)	Fernstrom Paper Mills, Inc., Pomona, Calif.
Pony Gummer	Small table gummer	New Jersey Machine Corp., Hoboken, N. J.
Pony Labelrite	Midget labeling machine	New Jersey Machine Corp., Hoboken, N. J.
Popular Leather	Ink embossed, uncoated, imitation leather, box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Popular Priced	Box cover paper	Chas. W. Williams & Co., Inc., New York
Popular Velvetex	Ink embossed, uncoated box paper	Hampden Glazed Paper and Box Co., Inc., Holyoke, Mass.
Porcelined	Beer cans	Continental Can Co., New York, N. Y.
Porcell	Paper drinking cup with tab or wire-pull lids	American Lace Paper Co., Milwaukee, Wis.
Porthos	Cover paper	United Mfg. Co., Springfield, Mass.
Port Low	Portable gravity sections	The Alvey-Ferguson Co., Cincinnati, Ohio
Postage Meter	Paper sealing tape	Gummed Tape & Devices Co., Bklyn, N. Y.
Postalati	Pocket letter scales	The Exact Weight Scale Co., Columbus, Ohio

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Pour-Aid	Liquor pourer	**Lanfare Molded Products, Toledo, Ohio**
Pour-N-Seal	Initial and re-sealing cap with lever and pouring spout	**Continental Can Co., New York, N. Y.** **The Crown Cork & Seal Co., Baltimore, Md.** Williams Sealing Corp., Decatur, Ill.
Pouring-Pull	Milk bottle cap	Sealright Co., Inc., Fulton, N. Y.
Powerflex	Conveyor	Island Equipment Corp., New York, N. Y.
Powerpac	Conveyor	Island Equipment Corp., New York, N. Y.
Powrweld	Foot power bag crimper	Cleveland Crimping Press Co., Cleveland, Ohio
Prac-Decal	Truck signs and lettering	The Meyercord Co., Chicago, Ill.
Precision	Medicinal droppers	**Pennsylvania Glass Products Co., Pittsburgh, Pa.**
Prepak	Corrugated boxes	The Hinde & Dauch Paper Co., Sandusky, Ohio
Pres-A-Ply	Pressure sensitive labels	Dennison Mfg. Co., Framingham, Mass.
Pre. Search	Product and package research technique	Ben Nash, New York, N. Y.
Presslt	Liquid dispensers	The Food Dispenser Co., Hartford, Conn.
Pressroom Aspirin	Ink reducer, offset preventive	E. J. Kelly Co., Subsidiary, Sun Chemical Corp., Kalamazoo, Mich.
Prestmark	Embossed paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Presto	Box and label printing machines	Markem Machine Co., Keene, N. H.
Presto	Home canning jars	Owens-Illinois Glass Co., Toledo, Ohio
Prestomark	Heat applied labels	Kaumagraph Co., Wilmington, Del.
Price It	Stock design cellophane bags	Milprint, Inc., Milwaukee, Wis.
Print-Ad-String	Cotton tape	Chicago Printed String Co., Chicago, Ill.
Print-a-Wrap	Cellophane sheets and rolls	Oneida Paper Prods., Inc., New York, N. Y. Continental Bag Specialties Corp., New York, N. Y.
Printcolor	Process for dyeing all forms of cellulose acetate and acetate butyrate (Tenite II)	Printloid, Inc., New York, N. Y.
Print-Cote	Protective overprint for coating printed sheets of cellulose acetate	Printloid, Inc., New York, N. Y.
Printcraft	Printed paper wrappings	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Printloid	Transparent containers	Printloid, Inc., New York, N. Y.
Print-O	Coated sulphite, waxed or plain	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Printweigh	Weight printing scales	Toledo Scale Co., Toledo, Ohio
Pris-O-Matic	Easy loading "Cellophane" bags	The Dobeckmun Co., Cleveland, Ohio
Producer	Produce wrapping machine	Gellman Mfg. Co., Rock Island, Ill.
Progressive-Net	Open mesh bags for produce	Progressive Bag Co., Inc., New Haven, Conn.
Pro-Lac	Decalcomania transfers and displays	Process Displays, Inc., Milwaukee, Wis.
Pro-plastik	Plastic displays	Process Displays, Inc., Milwaukee, Wis.
Prosperity	Meat wrapping paper	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Protectall	Fibreboard and corrugated board boxes	**Container Corp. of America, Chicago, Ill.**
Protection-Plus	Special bags for food and chemicals	Equitable Paper Bag Co., Inc., Long Island City, N. Y.
Protectopac	Specialty wraps	**Milprint, Inc., Milwaukee, Wis.**
Protek	Padding	American Lace Paper Co., Milwaukee, Wis.
Protek-Coat	Asphalt compound for moisture barriers	The Davison Chemical Corp., Baltimore, Md.
Protek-Film	Asphalt compound for hot-dip coating over metal foil	The Davison Chemical Corp., Baltimore, Md.
Protek-Seal	Asphalt compound	The Davison Chemical Corp., Baltimore, Md.
Protek-Sorb	Silica gel dehydrating agent	The Davison Chemical Corp., Baltimore, Md.
Protektar	Moth-repellent paper	Central States Paper & Bag Co., St. Louis, Mo.
Protektol	Transparent stripping lacquer	Ault & Wiborg, Div. Interchemical Corp., New York, N. Y.
Protino	Label adhesive	The Fales Chemical Co., Inc., Cornwall Landing, N. Y.
Proxmelt	Coatings and adhesives	Pyroxylin Products, Inc., Chicago, Ill.
Proxmesh	Closed mesh fabrics	Pyroxylin Products, Inc., Chicago, Ill.
Prox Peel	Hot dip ethyl cellulose compound	Pyroxylin Products, Inc., Chicago, Ill.
Prystal	Clear cast phenolic plastic	**Catalin Corp., New York, N. Y.**
Pure-Cone	Paper bottle	Sutherland Paper Co., Kalamazoo, Mich.
Pure Pail	Ice cream package	Bloomer Bros. Co., Newark, New York State
Pure-Pak	Paper milk containers	**American Paper Bottle Co.,** Toledo, Ohio
Pure-Pak	Machine for fabricating, filling and sealing paper milk bottles	Ex-Cello Corp., Detroit, Mich.
Pure Pak	Milk containers	Fibreboard Prods., Inc., San Francisco, Calif.
Pure Pak	Milk blanks	The Gardner-Richardson Co., Middletown, Ohio
Pure-Pak	Non-toxic paste	National Adhesives, New York, N. Y.
Pure-Pak	Milk containers	**Single Service Containers, Inc.,** New York, N. Y.
Puritan	Cups and food packs	The American Paper Goods Co., Kensington, Conn.
Puritan	Milk blanks	The Gardner-Richardson Co., Middletown, Ohio
Puro Pak	Poultry box lining waxed paper	**Central Waxed Paper Co., Chicago, Ill.**
Purse Kit	Cosmetic kit	**Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.**
Pyralin	Cellulose nitrate (pyroxylin)	E. I. du Pont de Nemours & Co. Inc., Wilmington, Del.
Pyralon	Box paper	**Marvellum Co., Holyoke, Mass.**
Pyrette	Box paper	**Kupfer Bros. Co., New York,** N. Y.
Pyrex	Serum bottles, laboratory and pharmaceutical glassware	Corning Glass Works, Corning, N. Y.
Pyrodescent	Iridescent or pearl papers	**Pyrotex Leather Co., Leominster, Mass.**
Pyrogloss	Pyroxylin coated metallic box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Pyro-Seal	Pyroxylin coated metallics	Bradner Smith & Co., Chicago, Ill.
Pyro Sheen	Pyroxylin coated papers	**Pyrotex Leather Co., Leominster, Mass.**
Pyroxcote	Lacquer and protective coatings	**Pyroxylin Products, Inc., Chicago, Ill.**
Pyroxylin	Printing inks	Geo. H. Morrill Div., Sun Chemical Corp., New York, N. Y.
Q.E.D.	Bottle label gum	F. G. Findley Co., Milwaukee, Wis.
Quadrimatic	Transparent bag of exceptional strength	The Dobeckmun Co., Cleveland, Ohio
Quality Cheviot	Box cover papers	Pejepscot Paper Co., Inc., New York, N. Y.
Quality Cloud	Box cover papers	Pejepscot Paper Co., Inc., New York, N. Y.
Queen	White grocery bags	Consolidated Paper Bag Co., Somerville, Mass.
Quick	Printing inks, lithographic supplies	**International Printing Ink, Div. Interchemical Corp., New York, N. Y.**
Quik-Fold	Folding carton	Old Dominion Box Co., Lynchburg, Va.
Quick Pac	Cracker caddy	**Robert Gair Co., Inc., New York, N. Y.**
Quikseal	Closure	**Owens-Illinois Glass Co., Toledo, Ohio**
Quik-Set	Folding carton	**Robert Gair Co., Inc., New York, N. Y.**
Quickset	Rapid drying ink	Pope & Gray, Inc., New York, N. Y.
Quick-Set	Compound	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
R.C.Chipboard	Super finish chipboard	The Butterfield-Barry Co., New York, N. Y.
R. F.	Flock papers, velour type	Keller-Dorian Corp., New York, N. Y.
R-70	Rigid transparent fabricating machine	Taber Instrument Corp., N. Tonawanda, N. Y.
R.T.G.	Folding cartons and displays	**The Richardson Taylor-Globe Corp., Cincinnati, Ohio**
R-V-Food	Frozen food cartons	Arvey Corp., Chicago, Ill.
R-V-Lite	Transparent window material	Arvey Corp., Chicago, Ill.
R-V-Seal	Adhesives	Arvey Corp., Chicago, Ill.
Radiant	Embossed foil labels and seals	French-Bray Printing Co., Baltimore, Md.
Radiant	Embossed paper—not coated	**Hampden Glazed Paper & Card Co., Holyoke, Mass.**
Rainbow	Flint paper	**Bradner Smith & Co., Chicago,** Ill.
Rainbow	Reinforced cellophane bags	The Munson Bag Co., Cleveland, Ohio
Rainbow	Paper for box coverings	**Pejepscot Paper Co., New York, N. Y.**
Rainbow	Box covering paper	**Chas. W. Williams & Co., Inc., New York, N. Y.**
Rajahgrey	High strength fibreboard	The Rogers Paper Mfg. Co., Manchester, Mass.
Raltex Protexal	Reinforced waterproof paper	W. Ralston & Co., Inc., Niagara Falls, N. Y.
Rapid Power Booster	Power belt conveyor, portable	The Rapids Standard Co., Inc., Grand Rapids, Mich.
Rapid-Wheel	Gravity conveyors	The Rapids Standard Co., Inc., Grand Rapids, Mich.
Rarewood	Woodgrain box papers	**Hazen Paper Co, Holyoke, Mass.**
Raycote	Evenly cut rayon stock	Rayon Processing Co. of R. I., Central Falls, R. I.
Rayette	Box paper	**Kupfer Bros. Co., New York,** N. Y.
Raymix	Suede finish rayon stock	Rayon Processing Co. of R. I., Central Falls, R. I.
Rayon	Mica coated paper	**Marvellum Co., Holyoke, Mass.**
Rayon-Bow	Rayon ties	**Fibre Cord Co., New York,** N. Y.
Ray-Rib	Rayon ribbons and ties	**Fibre Cord Co., New York,** N. Y.
Real	Greaseproof	**Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.**
Really Flo	Gummed papers	**Mid-States Gummed Paper Co., Chicago, Ill.**
Red Core	Gummed papers and cloth	Rexford Paper Co., Milwaukee, Wis.
Red Diamond	Automatic labeling machine	**The Liquid Carbonic Corp.,** Chicago, Ill.

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Reddirap	Greaseproof wrap for liners, etc.	Riegel Paper Corp., New York, N. Y.
Red Hoop	Cone-top, jacketed cans	Conneaut Can Co., Conneaut, Ohio
Red Streak	Sealing tape	The Brown Bridge Mills Inc., Troy, Ohio
Red Stripe	Extra heavy box cambric	Rexford Paper Co., Milwaukee, Wis.
Red Tye	Mailing bags	Chase Bag Co., Chicago, Ill.
Reel-Hide	Box cover paper	Matthias Paper Corp., Phila., Pa.
Reel-Pak	Fibre film boxes	Gaylord Container Corp., St. Louis, Mo.
Reflectone	Flint and friction glazed papers	Wyomissing Glazed Paper Co., Reading, Pa.
Registron	Electric eye device for color register	Champlain Co., Bloomfield, N. J.
Reilly Indur	Molding powders & phenol-formaldehyde resins, etc.	Reilly Tar & Chemical Corp., Indianapolis, Ind.
Reindeer	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Renaissance	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Renlcote	Metallic printing stock for box covering	Reynolds Metals Co., Richmond, Va.
Rep	Rib embossed, metallic striped box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Repace	Wrappers—indented inner and outer wraps	The Republic Paperboard Co., Cincinnati, Ohio
Re-Pel	Water repellent paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Repelall	Greaseproof paper	Hazen Paper Co., Holyoke, Mass.
Repelaqua	Waterproof liner papers	Protective Coatings Corp., Belleville, N. J.
Reptile	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Re-Seal-It	Re-sealing bottle caps	Reynolds Metals Co., Richmond, Va.
Resigum	Sizing adhesive	Paisley Products, Inc., Chicago, Ill.
Resimene	Melamine formaldehyde	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Resinox	Phenol formaldehyde	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Resyn	Line of synthetic resin emulsions, lacquers, hot melts	National Adhesives, New York, N. Y.
Revelation	Opaque sidewall material with transparent window; rolls or bags	Milprint, Inc., Milwaukee, Wis.
Revelation	Inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Revolving Merchandiser	Electric turntables	Motion Displays, Inc., Bklyn, N. Y.
Rex	Conveyor	Chain Belt Co., Milwaukee, Wis.
Reyco	Metal bottleneck wraps	Reynolds Metals Co., Richmond, Va.
Reycraft	Corrugated decorative display papers and boards	The Reyburn Mfg. Co., Inc., Phila., Pa.
Reycurv	Corrugated decorative display papers and boards	The Reyburn Mfg. Co., Inc., Phila., Pa.
Reydec	Corrugated decorative display papers and boards	The Reyburn Mfg. Co., Inc., Phila., Pa.
Reyflute	Corrugated decorative display papers and boards	The Reyburn Mfg. Co., Inc., Phila., Pa.
Reynolds Pak	Single unit all-aluminum for frozen foods and other products	Reynolds Metals Co., Richmond, Va.
Reyseal	Foil heat-sealing material	Reynolds Metals Co., Richmond, Va.
Reytone	Corrugated decorative display papers and boards	The Reyburn Mfg. Co., Inc., Phila., Pa.
Reytrim	Corrugated decorative display papers and boards	The Reyburn Mfg. Co., Inc., Phila., Pa.
Rezistol	Varnished closure paper	General Felt Products, Div. Standard Cap & Seal Corp., Bklyn, N. Y.
Rextak	Water resistant emulsion	Stein, Hall & Co., Inc., New York, N. Y.
Rhomboid	Display carton	Robert Gair Co., Inc., New York, N. Y.
Ribbon and Pine	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Ribbonette	Cotton ribbon	Chicago Printed String Co., Chicago, Ill.
Rib-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Richleaf Gold and Platinum	Casein metallic coated papers	Hampden Glazed Paper & Card Co., Holyoke, Mass.
Ridgelo	Clay coated boxboard; laminated specialty boards	Lowe Paper Co., Ridgefield, N. J.
Riegeline	Transparent glassine	Riegel Paper Corp., New York, N. Y.
Riegelite	Transparent waxed glassine	Riegel Paper Corp., New York, N. Y.
Riegel-X	Resin impregnated paper	Riegel Paper Corp., New York, N. Y.
Rim Grip	Beaded tumbler caps	Swan Metal Cap Co., Inc., Chicago, Ill.
Rimseal	Closures	The Aridor Closure Div., of Ball Bors. Co., Chicago, Ill.
Ring-Seal Drum	Liquid holding fibre drum	Beacon Container Co., New York, N. Y.
Ripco	Greaseproof paper	Rhinelander Paper Co., Rhinelander, Wis.
Ripco Auto-Pak	Greaseproof innerwrap	Rhinelander Paper Co., Rhinelander, Wis.
Rip-Cord	Device for closing cotton and burlap bags	Bemis Bro. Bag Co., St. Louis, Mo.
Riplette	Box paper	Kupfer Bros. Co., New York, N. Y.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Ripple	Box cover	District of Columbia Paper Mills, Inc., Washington, D. C.
Ripplekraft	Non-waterproof crinkled wrapper	Angier Corp., Framingham, Mass.
Ripplestone	Box covering paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Rippl'Tie	Ribbons	Chicago Printed String Co., Chicago, Ill.
Rite-Price	Stock printed cellophane bags	The Dobeckmun Co., Cleveland, Ohio
Rite-Seal	Liquid adhesive for cartons	Stein, Hall & Co., Inc., New York, N. Y.
Rite-Way	Kraft paper and bags	Gaylord Container Corp., St. Louis, Mo.
Rockemarker	Hand marking devices	Adolph Gottscho, Inc., New York, N. Y.
Rockette	Box paper	Kupfer Bros. Co., New York, N. Y.
Rolamarker	Hand marking devices	Adolph Gottscho, Inc., New York, N. Y.
Rolatone	Concentrate for rollers	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Roller Set	Roller marking and stenciling	Floquil Products, Inc., New York N. Y.
Roll-O-Mastic	Labels, heat sealing (roll type)	Miller & Miller, Atlanta, Ga.
Roll-or-Wheel	Portable conveyor	The E. W. Buschman Co., Inc., Cincinnati, Ohio
Roll-Rite	Rolling pin	Owens-Illinois Glass Co., Toledo, Ohio
Romantic	Paper, Italian marble printed	George W. Anderson, Inc., Long Island City, N. Y.
Rose	Display box	Morris Paper Mills, Chicago, Ill.
Rotary	Automatic labeler	Economic Machinery Co., Worcester, Mass.
Rotokits	Containers for spices, herbs and salts	Gutterson & Co., Inc., New York, N. Y.
Rotopaque	Printing process for transparent film	The Munson Bag Co., Cleveland, Ohio
Roto Prints	Metallic box covering paper	Holyoke Card & Paper Co., Springfield, Mass.
Rotoseal	Carton forming, lining, folding, closing, machine	Interstate Folding Box Co., Middletown, Ohio
Roverseal	Roll-on tamperproof over R. O. closure	Aluminum Seal Co., New Kensington, Pa.
Royal	Protective milk bottle hoods	Reynolds Metals Co., Richmond, Va.
Royalflex Films	Laminated and coated films	Thomas M. Royal & Co., Phila., Pa.
Royalgrey	High strength fibreboard	Rogers Corp., Manchester, Conn.
Royal Satin	Quality newsboard for quality boxes	The Bufferfield-Barry Co., Inc., New York, N. Y.
Royal Swan	Ribbons and ties	Stark Bros. Ribbon Co., New York, N. Y.
Royal White	Semi-transparent sulphite, waxed or raw stock	Kalamazoo Vegetable Parchment Co. Kalamazoo Mich.
Ruby	Kraft grocery bags	Consolidated Paper Bag Co., Somerville Mass.
Rushtec	Imitation English grass paper	Paper Affiliates, Dept., Nalco, Inc., New York, N. Y.
Rust Veto	Rust preventative compound	E. F. Houghton & Co., Phila., Pa.
Rutherford	Lithographic and printing machinery	Rutherford Machinery Co. Div., Sun Chemical Corp., New York, N. Y.
S Brand	Greaseproofing and moisture-resistant agent	Philadelphia Quartz Co. Phila., Pa.
S.K.S.	Flexible glue	Paisley Products, Inc., Chicago, Ill.
SOS	Grocery bags	Consolidated Paper Bag Co., Somerville, Mass.
SOS Compound	Printing ink compound	The Braden Sutphin Ink Co., Cleveland, Ohio
S & S	Filling, packaging machines	Stokes & Smith Co., Frankford, Phila., Pa.
S T	Double shell caps	Phoenix Metal Cap Co., Chicago, Ill.
Safedge	Tumblers	Owens-Illinois Glass Co., Toledo, Ohio
Saf-Eg	Cushion bottom egg carton	Sutherland Paper Co., Kalamazoo, Mich.
Safe-Hed	Steel stamp	Jas. H. Matthews & Co., Pittsburgh, Pa.
Safe Myx	Spray solution	Triangle Ink & Color Co., Inc., Bklyn, N. Y.
Safe Pack	Automatic egg carton	Grant Paper Box Co., Pittsburgh, Pa.
Safetch	Offset plate etch	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Safetex	Gummed paper sealing tape	Central Paper Co., Menasha, Wis.
Safetex	Carton for textile products	Shuttleworth Carton Co., Inc., New York, N. Y.
Safe-T-Seal	Sealing tape	Rexford Paper Co., Milwaukee, Wis.
Safe-T-Seal	Gummed transparent seals	The Tablet & Ticket Co., Chicago, Ill.
Safety-Seal	Mailing boxes	W. H. Deisroth Co., Inc., Phila., Pa.
Safety-Seal	Bottle-applied secondary closure	Ferdinand Gutmann & Co., Bklyn, N. Y.
Safety Sealer	Closing machine (double seamer)	The Max Ams Machine Co., Bridgeport, Conn.
Safeway	Brush top closure applicator	Double Duty Products, Inc., Cleveland, Ohio
Safeway	Rolls of cellophane and cutters	Yorkville Paper Co., Inc., New York, N. Y.
Saflex	Safety glass plastic, vinyl acetal	Monsanto Chemical Co., Plastics Div., Springfield, Mass.

XUM

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Saf-T-Loid	Transparent containers	Parfait Sales, Chicago, Ill.
St. Albans	Colored design papers	Stevens, Nelson Paper Corp., New York, N. Y.
St. Valentine	Box paper	Kupfer Bros. Co., New York, N. Y.
Salem	Full color advertising folders	Stecher-Traung Lithograph Corp., Rochester, N. Y.
Sales Appeal	All coated moistureproof bags	Paramount Paper Products Co., Inc., Phila., Pa.
Salespackage	Glass containers	Owens-Illinois Glass Co., Toledo, Ohio
Salvage Kraft	Obliterating color	Floquil Products, Inc., New York, N. Y.
Samco Jr.	Liquid filling machine	Pneumatic Scale Corp., Ltd., North Quincy, Mass.
Sandalwood	Imitation wood grain box covers	District of Columbia Paper Mills, Inc., Washington, D. C.
Sani-Glas	Processed sterilized prescription bottles	Brockway Glass Co., Inc., Brockway, Pa.
Saniseal	Milk and demijohn closure	Ferdinand Gutmann & Co., Bklyn, N. Y.
Sani-Sherm	Fluted liners	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Sanitair	High-speed automatic rotary air cleaner	U. S. Bottlers Machinery Co., Chicago, Ill.
Sanitape	Tablet packager	Ivers-Lee Co., Newark, N. J.
Sanitape-Sealtite	Heat-sealed, unit packages of tablets, capsules, pills	Ivers-Lee Co., Newark, N. J.
Sani-Trete	Condiment dispensers	Imperial Molded Products Corp., Chicago, Ill.
Saran	Vinylidene chloride copolymer film	The Dow Chemical Co., Midland, Mich.
Saranac	Wire stitching machines	Saranac Machine Co., Benton Harbor, Mich.
Sare-Seal	Heat sealing machines	Sav-Way Industries, Detroit, Mich.
Sateen	Mica embossed	Hampden Glazed Paper & Card Co., Holyoke, Mass.
Satinettes	Box paper	Kupfer Bros. Co., New York, N. Y.
Satin Finish	Ribbons	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Satin-Glo	Display fabric	Columbus Coated Fabrics Corp., Columbus, Ohio
Satinteen	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Satintone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Satinwood	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Save-A-Seal	Closure	Owens-Illinois Glass Co., Toledo, Ohio
Saxolin	Open mesh bags	Chase Bag Co., Chicago, Ill.
Saxoliners	Box, bag and barrel liners	Chase Bag Co., Chicago, Ill.
Scandia	Cellulose wrapping machines	Scandia Mfg. Co., N. Arlington, N. J.
Scientific	Filling machines	Scientific Filter Co., New York, N. Y.
Scotch	Cellulose tape, pressure sensitive	Minnesota Mining & Manufacturing Co., St. Paul, Minn.
Scotch fabrics	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Scotch Plaids	Paper for box coverings	Pejepscot Paper Co., New York, N. Y.
Scotch-Rap	Moisture, vapor- and grease-proof wrapper	Minnesota Mining & Mfg. Co., St. Paul, Minn.
Scotchweave	Box covers	District of Columbia Paper Mills, Inc., Washington, D. C.
Scott	Net weighing and filling machines	U. S. Automatic Box Machinery Co., Inc., Roslindale, Boston, Mass.
Scuff-Proofed	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Scul-Prul	Box cover paper	Matthias Paper Corp., Phila., Pa.
Scutan	Waterproof paper	Union Bag & Paper Corp., Scutan Div., New York, N. Y.
Seafoam	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Seal-All	Glue	The F. G. Findley Co., Milwaukee, Wis.
Seal Brand	Bags, boxes, liners, packets and metal fold envelopes	Disbrow Mfg. Co., Newark, N. J.
Seal Brand	Adhesives	Philadelphia Quartz Co., Phila., Pa.
Sealcone	Paper container	American Sealcone Corp., New York, N. Y.
Seal-Kap	Protective milk bottle paper closure	American Seal-Kap Corp., Long Island City, N. Y.
Se-All	Jars and bottles	Owens-Illinois Glass Co., Toledo, Ohio
Sealon	Hooded milk bottle closure	The Sealright Co., Inc., Fulton, N. Y.
Sealright	Protective paper containers	Sealright Co., Inc., Fulton, N. Y.
Seal-Spout	Aluminum pouring spout	Seal-Spout Corp., Newark, N. J.
Sealtight	Crimp heat sealing machines	Heat Seal-It Co., Phila., Pa.
Sealtight	Bag closing machine	Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Sealtite	Automatic paper bag sealing machines	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Sealtite	Dry cold water-soluble glue	National Adhesives, New York, N. Y.
Sealtite-Uniwrap	Individual label attached package	Ivers-Lee Co., Newark, N. J.
Sealtonic	Wetting agent	Seal, Inc., Shelton, Conn.
Seal Top	Spouted closure	Plastic Engineering, Inc., Cleveland, Ohio
Seal-Tye	Combination pasted and metal tie closure	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Sealz	Hot melts	Dispersions Process, Inc., New York, N. Y.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Seam Gum F	Waterproof bag adhesives	Stein, Hall & Co., Inc., New York, N. Y.
Sebrof	Poster making process	The Forbes Lithograph Mfg. Co., Boston, Mass
Secure-Seal	Metal screw closures	West Penn Mfg. & Supply Corp., Brackenbridge, Pa.
Security Stitcher	Wire stitching and stapling machine	Paslode Co., Chicago, Ill.
See-Thru	Rigid transparent containers and displays	Geo. V. Clark Co., Inc., Astoria, L. I., N. Y.
Selectrol	Automatic checkweigher	The Exact Weight Scale Co., Columbus, Ohio
Self-Locking	Egg carton	Self-Locking Carton Co., Chicago, Ill.
Self Seal	Open end envelopes	U. S. Envelope Co., Springfield, Mass.
Sell-O-Face	Window bags and wraps	Thomas M. Royal & Co., Phila., Pa.
Sell-O-Royal	Transparent bags and envelopes	Thomas M. Royal & Co., Phila., Pa.
Selmor	Display stands	Hinde & Dauch Paper Co., Sandusky, Ohio
Semi-Seal	Cellophane glued to backboard	Milprint, Inc., Milwaukee, Wis.
Senior Krimper	Light weight jaw type krimper for bags	Pack-Rite Machine Corp., Milwaukee, Wis.
Sentry-Seal	Closure	Owens-Illinois Glass Co., Toledo, Ohio
Serpette	Box paper	Kupfer Bros. Co., New York, N. Y.
Servex	Waterproof duplex papers	Cincinnati Industries, Inc., Cincinnati (Lockland), Ohio
Servseal	Combination closure and dispenser	Guardian Safety Seal Co., Chicago Ill.
Servitex	Imitation leather	Cincinnati Industries, Inc., Cincinnati (Lockland), Ohio
Seybold	Paper cutters	Harris-Seybold Co., Cleveland, Ohio
Seybold Precision	Die presses	Harris-Seybold Co., Cleveland, Ohio
Seymour	Decorated metal containers	Seymour Products Co., Seymour, Conn.
Shadotone	Secondary color inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Shadowgraph	Checkweighing and packaging scale	The Exact Weight Scale Co., Columbus, Ohio
Shadowplaid	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Sheencote	High gloss, waterproof box cover or label paper	E. W. Twitchell, Inc., Pkg. Div., Phila., Pa.
Sheer-Glaze	Tissue paper	Thilmany Pulp & Paper Co., Kuakauna, Wis.
Sheer Sheen	Mica coated papers	Hazen Paper Co., Holyoke, Mass.
Sheffalloy	Collapsible tubes	New England Collapsible Tube Co., Chicago, Ill.
Sheffield Process	Method of tempering collapsible tube metals	New England Collapsible Tube Co., Chicago, Ill.
Shelpco 4 Star	Silver chests for packaging silverware	Henry H. Sheip Mfg. Co., Phila., Pa.
Shellback	Double shell caps	Anchor Hocking Glass Corp., Lancaster, Ohio
Shell-Cote	Heat-sealing coating	Shellmar Products Corp., Mt. Vernon, Ohio
Shell-Flex	Laminations of foil to other materials	Shellmar Products Corp., Mt. Vernon, Ohio
Shell-Glo	Laminations of unprinted transparent film to printed materials	Shellmar Products Corp., Mt. Vernon, Ohio
Shell-Mark	Printed stock transparent bags	Shellmar Products Corp., Mt. Vernon, Ohio
Shell-Pakit	Printed rolls of transparent film	Shellmar Products Corp., Mt. Vernon, Ohio
Shell-Pax	Transparent cellulose containers	Shellmar Products Corp., Mt. Vernon, Ohio
Shell-Pli	Printed laminated cellulose	Shellmar Products Corp., Mt. Vernon, Ohio
Shell-Tint	Transparent tint over transparent cellulose	Shellmar Products Corp., Mt. Vernon, Ohio
Shell-Vue	Transparent gummed acetate posters	Shellmar Products Corp., Mt. Vernon, Ohio
Shield-Pak	Corrugated for box interiors	Ajax Box Co., Chicago, Ill.
Shnflex	Protective coating compounds	Gordon-Lacey Chemical Products Co., Maspeth, L. I., N. Y.
Shoksorb	Indented packing paper	Schmidt & Ault Paper Co., York, Pa.
Shopak	Transparent acetate containers	Shaw Paper Box Co., Meriden, Conn.
Sho-Paks	Glassine envelopes	Alexander Herz Co., Inc., New York, N. Y.
Showbox	Transparent boxes, cans and containers	Central States Paper & Bag Co., St. Louis, Mo.
Showmaster	Electric turntables	Motion Displays, Inc., Bklyn, N. Y.
Show Pak	Rigid transparent container	Shaw-Randall Co., Pawtucket, R. I.
Shu-Pac	Folding cartons for shoes	Gordon Cartons, Inc., Baltimore, Md.
Shurpak	Egg carton, V-bottom cushioned	Empire Box Corp., Garfield, N. J.
Shy-Nee	Printing inks, lithographic supplies	International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Sifta-Seal	Dispensing closure	Ferdinand Gutmann & Co., Bklyn, N. Y.
Signodes	Steel strapping	Signode Steel Strapping Co., Chicago, Ill.
Silidex	Dry, cold water soluble adhesive	National Adhesives, New York, N. Y
Silk Sheen	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Silray	Silver coated paper	The Marvellum Co., Holyoke, Mass.

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Silvalum	Silver embossed paper	Springfield Coated Paper Corp., Camden, N. J.
Silvenear	Inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Silver Beams	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Silver Chami-Pak	Cigaret and tobacco, foil mounted	H. P. Smith Paper Co., Chicago, Ill.
Silver Foil 1941	Metallic coated, silver, plain and embossed	Louis Dejonge & Co., New York, N. Y.
Silver-Glass	Decorative wrappings	E. W. Twitchell, Inc., Phila., Pa.
Silvergloss	Silver print paper	The Marvellum Co., Holyoke, Mass.
Silver King	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Silverlink	Roller chain	Link-Belt Co., Chicago, Ill.
Silverlite	Imitation foil	Louis Dejonge & Co., New York, N. Y.
Silver Mosaic	Brightwood kid finish papers	Holyoke Card & Paper Co., Springfield, Mass.
Silver Plaid	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Silver Ray	Silver and color printed box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Silverseal	Colored specialty tape	Gummed Tape & Devices Co., Bklyn, N. Y.
Silversheen	Colored metallic inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Silver Shredder	Paper shredding machines	Industrial Shredder & Cutter Co., Salem, Ohio
Silverstitch	Stitching wire	Acme Steel Co., Chicago, Ill.
Silverstitcher	Stitching machine	Acme Steel Co., Chicago, Ill.
Silverstreak	Silent chain	Link-Belt Co., Chicago, Ill.
Silvertone	Metallized cellulose ribbon	Fibre Cord Co., New York, N. Y.
Silvertone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Sil-Vor-Plate	Metallic inks	Geo. H. Morrill Div., Sun Chemical Corp., New York, N. Y.
Simco	Static eliminators	Maxson Automatic Machinery Co., Westerly, R. I.
Sim-Pac	Folding boxes shipped flat	Paper Package Co., Indianapolis, Ind
Simplex	Wire staples	Acme Staple Co., Camden, N. J.
Simplex	Automatic tape dispenser	Better Packages, Inc., Shelton, Conn.
Simplex	Printing press	Miller Printing Machinery Co., Pittsburgh, Pa.
Simplex	Pie and cake container	Milprint, Inc., Milwaukee, Wis.
Simplex	Folding and set-up boxes	Simplex Paper Box Corp., Lancaster, Pa.
Simplex Hi-Speed	Bag making machine	Miller Wrapping & Sealing Machine Co., Chicago, Ill.
Single Impression White	Ink	Chemical Color & Supply Div., Sun Chemical Corp., Chicago, Ill.
Single Plate	Filter	Karl Kiefer Machine Co., Cincinnati, Ohio
Singletin	One-use collapsible tube	Victor Metal Products Corp., Bklyn, N. Y.
Singl-Vu	Window cartons	Rossotti Lithographing Co., Inc., N. Bergen, N. J.
Sisseal's'	Water-resistant asphalt, resin	Power Products, Inc., Chicago, Ill.
Skytogen	Box paper	Kupfer Bros. Co., New York, N. Y.
Skytone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Slak-Tite	Closure for slack filled paper bag	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Slant Side	Sloping side folding box	Michigan Carton Co., Battle Creek, Mich.
Slicewrap	Combination bread slicing and wrapping machine	Oliver Machinery Co., Grand Rapids, Mich.
SlideLid	Tablet boxes	Columbia Specialty Co., Inc., Baltimore, Md.
Slide-Off	Water type decalcomania	The Palm Bros. Decalcomania Co., Cincinnati, Ohio
Slink	Stamping ink for plastics	Louis Melind Co., Chicago, Ill.
Smico	Colored and metallic inks	Sleight Metallic Ink Co., Phila., Pa.
Smithcrafted	Metal wood leatherette boxes and displays	The S. K. Smith Co., Chicago, Ill.
Snack-Sacks	Sandwich bags	Thomas M. Royal & Co., Phila., Pa.
Snac-Pak	Corrugated basket container for cakes	The Ashtabula Corrugated Box Co., Ashtabula, Ohio
Snake Tape	Waterproof, reinforced gummed tape	Angier Corp., Framingham, Mass.
Snap-Loks	Attaching device embedded in tag	Dennison Mfg. Co., Framingham, Mass.
Snap-on	Cap for application to reuse tumblers	Sterling Seal Co., Erie, Pa.
Snopaque	Opaque, white glassine	Riegel Paper Corp., New York, N. Y.
Snowcap	Lining and white embossed paper	Bradner Smith & Co., Chicago, Ill.
Snowdrift	White opaque glassine	Rhinelander Paper Co., Rhinelander, Wis.
Snowflake	Padding	American Lace Paper Co., Milwaukee, Wis.
Snowflake and Star	Box cover paper	Holyoke Card & Paper Co., Springfield, Mass.
Snow White Litho	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Snowhite Stiktite	Box wrap	Fitchburg Paper Co., Fitchburg, Mass.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Soiseal	Waterproof gummed tape	Atlantic Gummed Paper Corp., Bklyn, N. Y.
Solac	Cellulose cement	Mass & Waldstein Co., Newark, N. J.
Solar	Box covers	District of Columbia Paper Mills, Inc., Washington, D.C.
Soldertite	Can spouts	Standard Specialty & Tube Co., New Brighton, Pa.
Solidry	Inks and varnishes	Pope & Gray, Inc., New York, N. Y.
Solseal	Water-resistant gummed tape	Central Paper Co., Menasha, Wis.
Solseal	Water-resistant tape	Mid-States Gummed Paper Co., Chicago, Ill.
Sonsettes	Box paper	Kupfer Bros. Co., New York, N. Y.
Soplasco	Thermoplastic tubing	Southern Plastics Co., Columbia, S. C.
Sorbolite	Light proof board	Waldorf Paper Products Co., St. Paul, Minn.
Sorting Scale	Automatic continuous check-weighing and sorting scale	Merrick Scale Mfg. Co., Passaic, N. J.
Spangles	Cellophane flock	Rayon Processing Co. of R. I., Central Falls, R. I.
Spanish Leather Paper	Colored and metallic spanished box cover paper	Hampden Glazed Paper & Card Co., Inc., Holyoke, Mass.
Spede-Pac	Plant filled ice cream pail	Bloomer Bros. Co., Newark, New York State
Speedseal	Tablet tape	Gummed Tape & Devices Co., Bklyn, N. Y.
Speed Limit	Halftone black inks	International Printing Ink Div. of Interchemical Corp., New York, N. Y.
Spee-D-Mark	Cellulose bags	U. S. Envelope Co., Springfield, Mass.
Speedry	Enclosed ink fountain on rotogravure press	Champlain Co., Inc., Bloomfield, N. J.
Speedweigh	Over and under checking scale	Toledo Scale Co., Toledo, Ohio
Speedway	Motors and display turntables	Speedway Mfg. Co., Cicero, Ill.
Sphinx	Adhesives	Arabol Mfg. Co., New York, N. Y.
Spic-N-Span	Roller wash	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Spiralon	Flint and foil box papers	Hazen Paper Co., Holyoke, Mass.
Spongeflex	Flexible non-warp glues	Paisley Products, Inc., Chicago, Ill.
Sport-Art	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Spot Lite	Glassine wrappers	Milprint, Inc., Milwaukee, Wis.
Sprague	Canning machinery	Food Machinery Corp., Sprague-Sells Div., Hoopeston, Ill.
Spray	Non-offset spray solution	Paisley Products, Inc., Chicago, Ill.
Springtime Line	Box cover paper	Matthias Paper Corp., Phila., Pa.
Spun-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Square-Pak	Paraffined ice cream container	Marathon Corp., Menasha, Wis.
Square Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Square-Tex	Printed box paper	The Marvellum Co., Holyoke, Mass.
Sta-Ahead	Hat stickers	Gummed Tape & Devices Co., Bklyn, N. Y.
Sta-Fresh	Waxed glassine bags	Oneida Paper Products, Inc., New York, N. Y.
Stainless	Metal foils	Continental Bag Specialties Corp., New York, N. Y. Keller-Dorian Corp., New York, N. Y.
Sta-Lox	Lock corner retail store boxes	Pollock Paper & Box Co., Dallas, Texas
Standard	Wrapping machine	American Machine & Foundry Co., Milwaukee, Wis.
Standard	Labeling machine and accessories	Liquid-Carbonic Corp., Chicago, Ill.
Standard Package Sealer	Gummed tape dispensing machines	Gummed Tape & Devices Co., Bklyn, N. Y.
Standee	Automatic multiwall paper bags	Union Bag & Paper Corp., New York, N. Y.
Stannum	Liquid paste	National Adhesives, New York, N. Y.
Stannyn	Imitation metallic paper	Kupfer Bros. Co., New York, N. Y.
Stapak	Fibre shipping drum	The Container Co., Div. Continental Can Co., Inc., Van Wert, Ohio
Staplecraft	Hand, foot, motorized stapling machines	Acme Staple Co., Camden, N. J.
Staplefast	Carton stitching machine	The Burgess Fastening Co., Cleveland, Ohio
Star	Adhesive	Bingham Bros. Co., New York, N. Y.
Star	Fountain marker	Wm. A. Force & Co., Inc., Bklyn, N. Y.
Star and Step	Box covers	District of Columbia Paper Mills, Inc., Washington, D.C.
Star Brand	Adhesives	Bingham Bros. Co., New York, N. Y.
Stardust	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Star Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Sta-Seal	Wrapping machines	Battle Creek Bread Wrapping Machine Co., Battle Creek, Mich.
Sta-Tuf	Meat packer wrappers	H. P. Smith Paper Co., Chicago, Ill.

XUM

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Sta-Warm	Heat sealers, dipping tanks and glue pots	Sta-Warm Electric Co., Ravenna, Ohio
Staybound	Cold process padding gum	The Commercial Paste Co., Columbus, Ohio
Staystuck	Crown closure	Ferdinand Gutmann & Co., Bklyn, N. Y.
Staytite	Gummed stay tape	Bradner Smith & Co., Chicago, Ill.
Steel Band	Steel strapping	American Steel Band Co., Pittsburgh, Pa.
Steel-Forge	Casters	The Rapids-Standard Co., Inc., Grand Rapids, Mich.
Steel-Set	Industrial repair glue	Paisley Products, Inc., Chicago, Ill.
Steelstrap	Steel strapping	Acme Steel Co., Chicago, Ill.
Stek-O	Labeling paste powder	Clark Stek-O Corp., Rochester, N. Y.
Stericaps	Aluminum seals for intravenous solutions, serums	Aluminum Seal Co., New Kensington, Pa.
Sterilined	Inner lined containers	The Interstate Folding Box Co., Middletown, Ohio
Sterling Tread	Gummed paper tape	The Gummed Products Co., Troy, Ohio
Steriseal	Steam vacuum capping machines	Anchor Hocking Glass Corp., Lancaster, Ohio
Stikfast	Label pasters	Diagraph-Bradley Stencil Machine Corp., St. Louis, Mo.
Stiktotin	Adhesive for labeling metal containers	Marks Chemical Works, New York, N. Y.
Streamer Bows	Pre-tied cellulose bows	Stark Bros. Ribbon Corp., New York, N. Y.
Streamline	Boxes and cases	Farrington Mfg. Co., Boston, Mass.
Stretchrap	Wrapping machine	Stokes & Smith Co., Frankford, Phila., Pa.
Stripcoat	Hot dip stripping melt	Dow Chemical Co., Midland, Mich.
Stripe & Pine	Fancy printed Christmas papers	Louis Dejonge & Co., New York, N. Y.
Striplex	Box stripping glue	National Adhesives, New York, N. Y.
Stripseal	Ethylcellulose stripping compound	Wills & Roberts Plastics Mfg. Corp., Pasadena, Calif.
Stripsol	Cold water soluble stripping glue	Paisley Products, Inc., Chicago, Ill.
Sturdi-Pac	Strong set-up boxes	Gordon Cartons, Inc., Baltimore, Md.
Sturdite	Leather cloth	Holliston Mills, Inc., Norwood, Mass.
Styl-O-Matic	Unscrambling table and bottle conveyor	Island Equipment Corp., New York, N. Y.
Style-Curve	Corrugated display material	Sherman Paper Products Corp., Newton Upper Falls, Mass.
Styron	Polystyrene molding granules	The Dow Chemical Co., Midland, Mich.
Submerso-Pak	Moistureproof paper products	Cincinnati Industries, Inc., Cincinnati (Lockland), Ohio
SUco	Overprint varnishes and specialties	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Suedette	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Sullmanco	Job inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Summit	Compound	Eagle Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Sunalloy	Tin substitute for tubes	Sun Tube Corp., Hillside, N. J.
Sunburst	Wide mouth food ware	Armstrong Cork Co., Lancaster, Pa.
Sunco	Dry colors	General Printing Ink Div., Sun Chemical Corp., New York, N.Y
Sunex	Transparent sheet	American Phenolic Corp., Chicago, Ill.
Sunrise	Sealing tapes	McLaurin-Jones Co., Brookfield, Mass.
Sunshine	Box cover paper	Matthias Paper Corp., Phila., Pa.
Sunshine	Box coverings	Bradner Smith & Co., Chicago, Ill.
Super-Cell	Egg cartons	Interstate Folding Box Co., Middletown, Ohio
SUperdense	Offset inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Superend	Ending glue	National Adhesives, New York, N. Y.
Super Fibre	Box board, metal edge boxes	National Metal Edge Box Co., Phila, Pa.
Super-Gloss	White ivory embossed and plain papers	The Marvellum Co., Holyoke, Mass.
Superkleen	Bottle washing machine	The Liquid Carbonic Corp., Chicago, Ill.
Superseal	Heat sealing glassine	Hartford City Paper Co., Hartford City, Ind.
Super Seal	Bread wrappers	Marathon Corp., Menasha, Wis.
Super-Seal	Leakproof cellophane bags	The Munson Bag Co., Cleveland, Ohio
Super-Seal	Glass vacuum jar	Super-Seal Container Corp., Washington, D. C.
SUperset	Heat reactive ink	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Superstrip	Stripping glue	National Adhesives, New York, N. Y.
Super-Ty	Cotton gift ribbon	General Printed String Co., Milwaukee, Wis.
Superwrap	Tight wrapping glue	National Adhesives, New York, N. Y.
Supreme	Transfer paper	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Supreme Black	Transfer paper	E. J. Kelly Co., Subsidiary, Sun Chemical Corp., Kalamazoo, Mass.
Sure-Grip	Steel Stamp	Jas. H. Matthews & Co., Pittsburgh, Pa.
Sure-Set	Rubber type holder	Jas. H. Matthews & Co., Pittsburgh, Pa.
Surehold	Sealing tape	Nashua Gummed & Coated Co., Nashua, N. H.
Sure Shot	Wire staples	Acme Staple Co., Camden, N. J.
Susan	Rayon ribbon	Freydberg Bros.-Strauss, Inc., New York, N. Y.
SUtility	Inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
SUtone	Inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
SUveneer	Inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Swan Rim Grip	Caps for beaded finish tumblers	Swan Metal Cap Co., Chicago, Ill.
Sweatless	Dusting powder for paper workers hands	Paisley Products, Inc., Chicago, Ill.
Sweepstakes	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Sweetone	Line of products	Geo. H. Sweetnam, Inc., Cambridge, Mass.
Sylphcase	Casings for meats	Sylvania Industrial Corp., New York, N. Y.
Sylph-Flake	Sylphrap confetti	Sylvania Industrial Corp., New York, N. Y.
Sylphrap	Transparent cellulose sheeting	Sylvania Industrial Corp., New York, N. Y.
Sylphseal	Bands, viscose (self-sealing)	Sylvania Industrial Corp., New York, N. Y.
Sylph-Thin	Casings for meats	Sylvania Industrial Corp., New York, N. Y.
Sylplast	Urea-formaldehyde adhesive	Sylvania Industrial Corp., New York, N. Y.
Synchro Ink	Printing inks, lithographic supplies	International Printing Ink, Div. Interchemical Corp., New York N Y
Syntron	Lacquers, varnishes and protective coating solutions	Gordon-Lacey Chemical Prods. Co., Maspeth, L. I., N. Y.
Syntron	Weighing machines, vibrators and packers	Syntron Co., Homer City, Pa.
TS RO	Top and side seal roll-on closure	Aluminum Seal Co., New Kensington, Pa.
T.W.	Liquid tightwrap glue	Paisley Products, Inc., Chicago, Ill.
Tag-O-Graph	Tag and label addressing machines	Weber Addressing Machine Co., Chicago, Ill.
Tanglefoot	Gummed kraft tape	The Tanglefoot Co., Grand Rapids, Mich.
Tap-A-Flow	Closure dispenser	Federal Tool Corp., Chicago, Ill.
Tape Shooter	Sealing tape machine	Better Packages, Inc., Shelton, Conn.
Tape-Tack	Tape moistening solution	Paisley Products, Inc., Chicago, Ill.
Tapoganth	Stripping gum	Stein, Hall & Co., Inc., New York, N. Y.
Tappit	Liquid dispensers	Food Dispenser Co., Hartford, Conn.
Tarcette	Box paper	Kupfer Bros. Co., New York, N. Y.
Taylor-Made	Set-up boxes	Taylor Box Co., Providence, R. I.
Tayper	Tape moistening machine	Nashua Package Sealing Co., Inc., Nashua, N. H.
Taypit	Cellulose self-sealing tape	International Plastic Corp., Morristown, N. J.
Tegumat L-2	Waterproof paper	W. Ralston & Co., Inc., Niagara Falls, N. Y.
Tekwood	Paper-covered plywood	U. S. Plywood Corp., New York, N. Y.
Telestop	Dispensing box	National Folding Box Co., New Haven, Conn.
Television	Metal and cellulose acetate cans	Geo. V. Clark Co., Inc., L. I. C., N. Y.
Tell-U-Tags	Marking tags	Dennison Mfg. Co., Framingham, Mass.
Tel-tale	Indicator type silica gel	The Davison Chemical Corp., Baltimore, Md.
Tenace	Gummed tape	Stein, Hall & Co., Inc., New York, N. Y.
Tenite	Cellulose acetate molding compound	Tennessee Eastman Corp., Kingsport, Tenn.
Tenite I	Cellulose acetate molding compound	Tennessee Eastman Corp., Kingsport, Tenn.
Tenite II	Cellulose acetate butyrate molding compound	Tennessee Eastman Corp., Kingsport, Tenn.
Tension Tie	String and button closure	Tension Envelope Corp., Kansas City, Mo.
Tensul-Tape	Unbleached cotton tape	General Printed String Co., Milwaukee, Wis.
Terrace	Gummed tape	Stein, Hall & Co., Inc., New York, N. Y.
Texcel	Cellulose pressure sensitive tape	Industrial Tape Corp., New Brunswick, N. J.
Texkraft	Pyroxylin coated composition base sheet	Textileather Corp., Toledo Ohio
Texol	Leatherette	Farrington Mfg. Co., Boston, Mass.
Tex-Pac	Corrugated shipping container	Old Dominion Box Co., Lynchburg, Va.
Texrope	Multiple V-belt drive	Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Textileather	Pyroxylin coated textile	Textileather Corp., Toledo, Ohio

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Textile Prints	Box cover paper	**Chas. W. Williams & Co., Inc., New York, N. Y.**
Textiloid	Lacquered rag paper	Textileather Corp., Toledo, Ohio
Textolite	Molded, laminated and extruded plastic	**General Electric Co., Plastic Div., Pittsfield, Mass.**
Thalid	Low pressure laminating resins	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
The Ideal	Stencil cutting machines	Ideal Stencil Machine Co., Belleville, Ill.
The Master	Fibre shipping drums and pails	The Master Package Corp., Owen, Wis.
Thermeto Wrap	Foil laminate, heat sealable	Keller-Dorian Corp., New York, N. Y.
Thermium	Heat sealing paper and tape	**Seal, Inc., Shelton, Conn.**
Thermo	Tin printing inks	**Crescent Ink & Color Co. of Pa., Phila., Pa.**
Thermobead	Beading machine for rigid transparent sheeting	Taber Instrument Corp., N. Tonawanda, N. Y.
Thermo Cote	Ethyl-cellulose protective stripping compound	Ernst Bischoff Co., Inc., New York, N. Y.
Thermocrease	Creasing machine, rigid transparent fabricating	Taber Instrument Corp., N. Tonawanda, N. Y.
Thermocurl	Machine, beading ends of plastic cylinders	**Taber Instrument Co., N. Tonawanda, N. Y.**
Thermodraw	Machine, drawing containers from sheet plastic	**Taber Instrument Co., N. Tonawanda, N. Y.**
Thermofold	Machine for forming tight or "U" folds	Taber Instrument Co., N. Tonawanda, N. Y.
Thermoloid	Asphaltum impregnated fibre plastic material	Chaspec Mfg. Co., Inc., New York, N. Y.
Thermo-Matic	Heat-seal label applier	**New Jersey Machine Corp., Hoboken, N. J.**
Thermo-Phane	Highly moisture resistant, heat sealable, laminated paper	**Interstate Folding Box Co.,** Middletown, Ohio
Thermoseal	Thermoplastic closure wraps, bags, liners	**Benj. C. Betner Co., Devon, Pa.**
Thermoseam	Machine for forming and cementing lap joint cyclinders	Taber Instrument Corp., N. Tonawanda, N. Y.
Therm-O-Top	Heat seal closure	**Thomas M. Royal & Co., Phila., Pa.**
Thilco	Paper specialties	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Thin-Wrap	Machines for wrapping with crimped ends	**Miller Wrapping & Sealing Machine Co., Chicago, Ill.**
Thistle	All types of adhesives	Arvey Corp., Chicago, Ill.
Three in One	Steel strapping tightening, sealing, and cutting tool	**Stanley Works, New Britain, Conn.**
3-M	Adhesives	**Minnesota Mining & Mfg. Co., St. Paul, Minn.**
Three-Point	Press printing machinery	Kidder Press Co., Inc., Dover, N. H.
Thrifty	Box cover papers	Pejepscot Paper Co., Inc., New York, N. Y.
Throway	No deposit, no return throw-away beer bottles	Anchor Hocking Glass Corp., Lancaster, Ohio
Ticco	General	**Triangle Ink & Color Co., Inc., Bklyn, N. Y.**
Tie-Tie	Gift wrappings, cards, ribbons, seals	**Chicago Printed String Co., Chicago, Ill.**
Tiger Stay	Box covering paper	**Chas. W. Williams & Co., Inc., New York, N. Y.**
Tilt-bak	Folding display carton	Sutherland Paper Co., Kalamazoo, Mich.
Timely Suggestions	Box paper	**Kupfer Bros. Co., New York, N. Y.**
Tinick	Tin and zinc coated paper and boards	Keller-Dorian Corp., New York, N. Y.
Tinsley	Display carton	**Robert Gair Co., Inc., New York, N. Y.**
Tinstic	Liquid paste	National Adhesives, New York, N. Y.
Tin-Tak	Glue	**The F. G. Findley Co., Milwaukee, Wis.**
Tiny Midget	Static eliminator	The Simco Co., Phila., Pa.
Tiplift	Milk bottle cap	**Sealright Co., Inc., Fulton, N. Y.**
Tip Off	Closure	**Owens-Illinois Glass Co., Toledo, Ohio**
Tite-Fit	Elastic tubing for covering regular and irregular shaped packages	Bemis Bro. Bag Co., St. Louis, Mo.
Tite-Lok	Square flat cellophane bags	**Oneida Paper Products, Inc.,** New York, N. Y. Continental Bag Specialties Corp., New York, N. Y.
Titelok	Cylindrical paper container	Sutherland Paper Co., Kalamazoo, Mich.
Tite-Seal	Cellophane bags and liners	Traver Corp., Chicago, Ill.
Tite-Top	Two-piece, locking cover box	**National Folding Box Co., New Haven, Conn.**
Tolex	Vinyl resin leather cloth	Textileather Corp., Toledo, Ohio
Tone-Craft	Display, corrugated	**Sherman Paper Products Corp., Newton Upper Falls, Mass.**
Topcote	Moisture-resistant coating	Brooks Bank Note Co., Springfield, Mass.
Topmost	Wire-handle paper pail (tin-seal)	Sutherland Paper Co., Kalamazoo, Mich.
Topper	Bottle carriers	**Container Corp. of America, Chicago, Ill.**
Tough Stuff	Offset plate graining machine box linings	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Toughie	Wet strength locker paper	Central Waxed Paper Co., Chicago, Ill.
Traco	Plain and printed cellophane products	**Traver Corp., Chicago, Ill.**
Traco-Paks	Wrappers for food products	Traver Corp., Chicago, Ill.
Tran-Cel-Seal	Cellulose tape	**Gummed Tape & Devices Co., Bklyn, N. Y.**
Transeen	Transparent sulphite self-sealing wrappers	Newark Paraffine & Parchment Paper Co., Newark, N. J.
Transel	Printed embossed transparent cellulose	The Marvellum Co., Holyoke, Mass.
Transitone	Leatherette paper	Bradner Smith & Co., Chicago, Ill.

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Transol	Solvent for removing transfers	Kaumagraph Co., Wilmington, Del.
Transowrap	Transparent cellulose sheeting	Transolene Co., Barrington, Ill.
Transpak	Chipboard container	Transcontinental Container Corp., Corona, N. Y.
Transplastics	Transparent plastics process	Waterbury Companies, Inc., Waterbury, Conn.
Trans-Print	Printing on transparent sheeting	The Forbes Litho. Mfg. Co., Boston, Mass.
Transtate Bags	Combination cellophane and glassine bags	**The Interstate Folding Box Co.,** Middletown, Ohio
Transvision	Transparent decalcomania labels	The Palographia Co., New York, N. Y.
Transwrap	Automatic packaging machine	**Stokes & Smith Co., Frankford, Phila., Pa.**
Tra-Pac	Refrigerator ice cream package	Bloomer Bros. Co., Newark, New York State
Trapcote	Grease resistant coating	**Brooks Bank Note Co., Springfield, Mass.**
Traversheen	Decorative wrappers and bands	Traver Corp., Chicago, Ill.
Tray-Pax	Transparent cellulose sheet with rigid base or back	**Shellmar Products Corp., Mt.** Vernon, Ohio
Treasure Chest	Pyrometer checking set	Thwing-Albert Instrument Co., Phila., Pa.
Tredonia	Moistureproof and greaseproof cartons	Fibreboard Products, Inc., San Francisco, Calif.
Tredonia	Moistureproof and greaseproof boxboard and boxes	Grant Paper Box Co., Pittsburgh, Pa.
Tredonia Board	Moistureproof and greaseproof boxboard	The Butterfield-Barry Co., Inc., New York, N. Y.
Trees, Angel, Dear	Fancy-printed Christmas papers	Louis DeJonge & Co., New York, N. Y.
Tricolette	Box paper	Kupfer Bros. Co., New York, N. Y.
Tricon	Metal cap screws	Anchor Hocking Glass Corp., Lancaster, Ohio
Triple Lock	Triple strength bottom cellophane bag	The Dobeckmun Co., Cleveland, Ohio
Triple Seal	Closure	**Owens-Illinois Glass Co., Toledo, Ohio**
Triple-Tec	Double corrugated for packing	**Sherman Paper Products Co., Newton Upper Falls, Mass.**
Tripletect	Three protection packaging paper	Central Paper Co., Inc., Muskegon, Mich.
Tripletite	Special friction top paint can	Continental Can Co., New York, N. Y.
Triplex	Labeling machines	The Liquid Carbonic Corp., Chicago, Ill.
Triplex	Wax and glue pots	Sta-Warm Electric Co., Ravenna, Ohio
Tri-Seal	Metal cigar wraps	Reynolds Metals Co., Richmond, Va.
Tri-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Tri-Sure	Steel drum closures	American Flange & Mfg. Co. Inc., New York, N. Y.
Tritect	Moisture-vaporproof cellulose film	The Dobeckmun Co., Cleveland, Ohio
Triumph	Steel type holders	Jas. H. Matthews & Co., Pittsburgh, Pa.
Trojan	Gummed paper tape	The Gummed Products Co., Troy, Ohio
Trophy	Metallic paper	Bradner Smith & Co., Chicago, Ill.
Tru-Art	Pictorials, food—illustrations, labels and cartons	Rossotti Lithographing Co., Inc., N. Bergen, N. J.
Tru-Hue	Patented window and counter displays	**James Andrew DeNina, New York, N. Y.**
Truckmaster	Motor truck scale	Toledo Scale Co., Toledo, Ohio
Tru Life	Eye-appeal food pictures	Epsen Lithographing Co., Omaha, Neb.
Tru-Pak	Satchel-bottom bags	**Cupples-Hesse Corp., St. Louis, Mo.**
Trutite	Key opening vacuum can	**Continental Can Co., New York, N. Y.**
Tru-Tone	Food pictorials for canned goods labels	**The U. S. Printing & Lithograph Co., Cincinnati, Ohio**
Tru-Vu	Pictorials, food—illustrations, labels and cartons	Rossotti Lithographing Co., Inc., N. Bergen, N. J.
Try-Sax	Cotton seed bags with trier stripes	Bemis Bro. Bag Co., St. Louis, Mo.
Tube-Seal-It	Semi-automatic bag and tube making machine	Heat Seal-It Co., Phila., Pa.
Tubol	Tube winding liquid adhesive	Stein, Hall & Co., Inc., New York, N. Y.
Tuf-Face	Steel stamp	Jas. H. Matthews & Co., Pittsburgh, Pa.
Tuffy	Nursing bottle (heat resistant glass)	Brockway Glass Co., Brockway, Pa.
Tuffy-Kaps	Sanitary protection for nursing bottle nipples	Brockway Glass Co., Inc., Brockway, Pa.
Tufwet	Wet strength paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Tu-Ply	Plywood shipping drum	Seymour & Peck Co., Chicago, Ill.
Turret	Automatic labeler	Economic Machinery Co., Worcester, Mass.
Tutone	Box covered paper	Chas. W. Williams & Co., Inc., New York, N. Y.
1239-A	Water-resistant tape	Mid-States Gummed Paper Co., Chicago, Ill.
Twincap	Milk bottle cap	Searlright Co., Inc., Fulton, N. Y.
Twinkles	Cone-shaped paper packing for ice cream	Dixie Cup Co., Easton, Pa.
Twinkle-Sheen	Embossed mica paper	Hazen Paper Co., Holyoke, Mass.
Twist Ems	Wire-reinforced tape	Germain's, Los Angeles, Calif.
250 Gum	Adhesives, starch derived	Stein, Hall & Co., Inc., New York, N. Y.
Two-In-One	Combined letter and sample mailing bag	**Bemis Bro. Bag Co., St. Louis, Mo.**

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TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
202 Moistureproof	Lamination with amorphous wax	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
TwoTone	Transparent ribbons and ties	Fibre Cord Co., New York, N. Y.
Two View	Label, food products	Muirson Label Co., Inc., Bklyn, N. Y.
Two Way	Labels for cans and glass	Muirson Label Co., Inc., Bklyn, N. Y.
Ty-Tone	Metallic edged ribbon	General Printed String Co., Milwaukee, Wis.
U.F. Disk	Filter	Scientific Filter Co., New York, N. Y.
U. 1	Wadding lined bags	Union Wadding Co., Pawtucket, R. I.
U.S.	Bottling machinery	U. S. Bottlers Machinery Co., Chicago, Ill.
U. S. S.	Line of steel products	Carnegie-Illinois Steel Corp., Pittsburgh, Pa.
U-C-IT	Open mesh bags	Premier Bag Co., Lyndhurst, N. J.
Uformite	Urea-formaldehyde molding compounds and resins	Resinous Products & Chemical Co., Phila., Pa.
Ullmanine	Printing ink	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Ultimate	Package piler	Island Equipment Corp., New York, N. Y.
Ultra-Force	Numbering machines	Wm. A. Force & Co., Inc., Bklyn, N. Y.
Ultropaque	Inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
U-Neek	Plate coating solution	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Unifoil	Light gauge metal mounted paper backing	Reynolds Metals Co., Richmond, Va.
Unifold	One-piece folding garment box	The Gardner-Richardson Co., Middletown, Ohio
Union	Point-of-sale displays	Union Steel Products Co., Albion, Mich.
Uniplex	Lug cap	National Seal Corp., Bklyn, N. Y.
Uniseal	Can sealing compound	The Max Ams Machines Co., Bridgeport, Conn.
Uniseal-Hermo Oil-proof	Sealing fluid for can ends	The Max Ams Machine Co., Bridgeport, Conn.
Unishell	One piece cap substitute for double shell cap	National Seal Corp., Bklyn, N. Y.
Unishell	Special one-piece screw cap	Continental Can Co., New York, N. Y.
Unitable	Conveyor	Island Equipment Corp., New York, N. Y.
Unitainer	One dose metal containers	Sun Tube Corp., Hillside, N. J.
United	Box covering and greeting card paper	United Mfg. Co., Springfield, Mass.
Unit Load	Steel band freight bracing method	Acme Steel Co., Chicago, Ill.
Universal	Stenciling fountain brush	Wm. A. Force & Co., Inc., Bklyn, N. Y.
Universal	Tablet counting and filling machine	Ivers-Lee Co., Newark, N. J.
Universal	Conveyor chain	Link-Belt Co., Chicago, Ill.
Universal	Bottle washers	The Liquid Carbonic Corp., Chicago, Ill.
Universal	Filling machines	Stokes & Smith, Frankford Phila., Pa.
Universal-Kottoner	Cotton wadding machine	Consolidated Packaging Machinery Corp., Buffalo, N. Y.
Upaco	Industrial adhesives	Union Paste Co., Hyde Park, Mass.
U-Press-It	Special opening pouring spout and cap	Continental Can Co., New York, N. Y.
Urac	Urea-formaldehyde adhesives and resins	American Cyanamid Co., Plastics Div., New York, N. Y.
Utilastic	Rubber to metal adhesive	Paisley Products, Inc., Chicago, Ill.
Utilitape	Cloth pressure sensitive water-resistant tape	Industrial Tape Corp., New Brunswick, N. J.
Utility	Filling machines	Triangle Package Machinery Co., Chicago, Ill.
V-Film	Synthetic transparent sheeting	Goodyear Tire & Rubber Co., Akron, Ohio
V-Line	Greaseproof, non-corrosive papers	Sherman Paper Products Corp., Newton Upper Falls, Mass.
V P O Closures	Vacuum pry-off metal caps	Crown Cork & Seal Co., Baltimore, Md.
V-Seal	Resin adhesive	National Adhesives, New York, N. Y.
V Seal 27	Water-resistant adhesive for cases	Stein, Hall & Co., Inc., New York, N. Y.
Vac-A-Loc	Brush top closure applicator	Brockway Glass Co., Inc., Brockway, Pa.
Vacutop	Brush and applicator closures	Double Duty Products, Inc., Cleveland, Ohio
Val Hue	Fused cut edge acetate rayon ribbon	Wm. E. Wright & Sons Co., West Warren, Mass.
Valor	Halftone black ink	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Valve	Collapsible tubes	National Collapsible Tube Co., Providence, R. I.
Vanity Line	Box cover paper	Matthias Paper Corp., Phila., Pa.
Vapetex	Thermoplastic coated board	The Interstate Folding Box Co., Middletown, Ohio
Vapolith	Speed-dry offset inks	International Printing Ink & Finishes Divs., Interchemical Corp., New York, N. Y.
Vapometer	Vapor transmission tester	Thwing-Albert Instrument Co., Phila., Pa.
Vapor Shield	Moisture resistant paper	Rexford Paper Co., Milwaukee, Wis.
Vaporin	Heat-set inks	International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Vaporin M.S.	Moisture-set inks	International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Vaposeal	Glassine paper lacquer coated	Westfield River Paper Co., Inc., Russell, Mass.
Vaposet	Odor-free ink	International Printing Ink and Finishes Divs., Interchemical Corp., New York, N. Y.
Vapotite	Wax laminated paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Vari-Pitch	Variable speed V-belt transmission	Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Vari-Tint	Name plates, seals	L. F. Grammes & Sons, Inc., Allentown, Pa.
Vari-Visco	Filling machine for viscous materials	Karl Kiefer Machine Co., Cincinnati, Ohio
Vegimal	Liquid tightwrap setup box glue	Paisley Products, Inc., Chicago, Ill.
Velboard	Velour box or chip board	Cellusuede Products, Inc., Rockford, Ill.
Velmar	Waterproof antique coated papers	The Marvellum Co., Holyoke, Mass.
Velmet	Greeting card paper	Springfield Coated Paper Corp., Camden, N. J.
Velmo	Box paper	The Marvellum Co., Holyoke, Mass
Velvet	Compound	Eagle Printing Ink Div., Sun Chemical Corp., New York, N. Y.
Velvet Chintz	Printed dull coated paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Velvetex	Ink embossed, dull finished, box cover paper	Hampden Glazed Paper and Card Co., Inc., Holyoke, Mass.
Velv-O-pake	White opaque for bread wrappers	Dixie Wax Paper Co., Dallas, Tex.
Versailles Satintone	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Vibra-Flow	Vibrating feeders, conveyors	Syntron Co., Homer City, Pa.
Vibra-Veyor	Heater for plastic powder	The Miskella Infra-Red Co., Cleveland, Ohio
Vibrox	Packers and settlers	B. F. Gump Co., Chicago, Ill.
Vichrome	Synthetic coating for protection against corrosive agents	Ault & Wiborg, Div. Interchemical Corp., New York, N. Y.
Vichrome	Primer for drum lining	International Printing Ink and Finishes Divs., Interchemical Corp., New York, N. Y.
Victor	Extra heavy kraft grocery bags	Consolidated Paper Bag Co., Somerville, Mass.
Victor	Closures, collapsible tubes and metal vials	Victor Products Corp., Bklyn, N. Y.
Victoria	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Victorian Floral	Fancy paper	Louis Dejonge & Co., New York, N. Y.
Victor Tape	Printed advertising tape	Chicago Printed String Co., Chicago, Ill.
Victory	Microcrystalline, laminating wax	Bareco Oil Co., Tulsa, Okla.
Victory	Rayon cut edge ribbon	Freydberg Bros.-Strauss, Inc., New York, N. Y.
Victorywrap	Heat sealing moisture-vapor resistant paper	Traver Corp., Chicago, Ill.
View Pac	Transparent bags, envelopes, rigid boxes	U. S. Envelope Co., Springfield, Mass.
Vigorette	Box paper	Kupfer Bros. Co., New York, N. Y.
Viking	Cellulose window gluing combining machine	E. G. Staude Mfg. Co., St. Paul, Minn.
Vimlite	Cellulose acetate impregnated wire	Celanese Plastics Corp., New York, N. Y.
Vinicote	Collapsible tube with protective inner coatings	New England Collapsible Tube Co., Chicago, Ill.
Vinylac	Vinyl lacquer solutions	Gordon-Lacey Chemical Products Co., Maspeth, L. I., N. Y.
Vinylite	Plastics and resins	Bakelite Corp., New York, N. Y.
Vinyl seal	Synthetic resin adhesives	Bakelite Corp., New York, N. Y.
Vinyon	Vinyl chloride-acetate polymers resins, fibers and yarns	Bakelite Corp., New York, N. Y.
Virkotype	Raised printing compounds	Wood, Nathan & Virkus Co., Inc., Racine, Wis.
Visco	Filling machine for viscous materials	Karl Kiefer Machine Co., Cincinnati, Ohio
Visinet	Open mesh bags	Bemis Bro. Bag Co., St. Louis, Mo.
Visitainer	Transparent container	Old Dominion Box Co., Lynchburg, Va.
Visking	Cellulose sausage casings, tubing	The Visking Corp., Chicago, Ill.
Visowrap	Cellophane and paper window wrapper	The Dobeckmun Co., Cleveland, Ohio
Visualize	Window and transparent bags	Paramount Paper Products Co., Inc., Phila., Pa.
Vitafilm	Transparent rubber-hydrochloride film	The Goodyear Tire & Rubber Co., Akron, Ohio
Vita-Guard	Sandwich bags	Western Waxed Paper Co., Los Angeles, Calif.
VitaMENU	Labels	The United States Printing & Litho Co., Cincinnati, Ohio
Vitene	Rubber blanket and roller rejuvenator	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Vivo-Lith Vignettes	Direct color photographic reproduction for labels, seed packets, etc.	Stecher-Traung Lithograph Corp., Rochester, N. Y.

Addresses of companies listed appear on pages 1022–1033

TRADE NAME	NATURE OR TYPE OF PRODUCT	COMPANY & ADDRESS
Viz	Molded plastics	Molded Insulation Co., Phila., Pa.
Vol-U-Meter	Semi-automatic drum filling valve	The Vol-U-Meter Co., Buffalo, N. Y.
Vortex Cups	Paper drinking cups and containers	Dixie Cup Co., Easton, Pa.
V-Seal	Waterproof bag seams, case liners, case sealing adhesives	Stein, Hall & Co., Inc., New York, N. Y.
Vue Lite	Translucent plastic sheets	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Vuemar	Marble graining on plastic with transparent openings	Design Center Inc., Flushing, L. I., N. Y.
Vue-Pac	Cellophane window display cartons, greaseproof liners	Gordon Cartons, Inc., Baltimore, Md.
Vuepak	Continuous length acetate film	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Vuepak	Rigid transparent materials	Monsanto Chemical Co., Plastics Div., Springfield, Mass.
Vuewood	Wood graining on plastic with transparent openings	Design Center Inc., Flushing, L. I., N. Y.
Vulcabeston	Synthetic rubber and asbestos	Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Vu-Net	Open mesh bags	The Grimes Co., Denver, Colo.
Wabacoat	Coated board	Container Corp. of America, Chicago, Ill.
Wabash	Waterproof tape	Mid-States Gummed Paper Co., Chicago, Ill.
Walsello	Cellophane ribbons	The Walser Mfg. Co., Inc., Clifton, N. J.
Ware Foils	Coated box coverings	McLaurin-Jones Co., Brookfield, Mass.
Waregold-Ware	Gold and platinum box coverings	McLaurin-Jones Co., Brookfield, Mass.
Warelac	Coated box coverings	McLaurin-Jones Co., Brookfield, Mass.
Wareplatinum	Platinum box covering	McLaurin-Jones Co., Brookfield, Mass.
Ware Super Colors	Coated box coverings	McLaurin-Jones Co., Brookfield, Mass.
Warnercraft	Set-up and folding boxes	The Warner Bros. Co., Bridgeport, Conn.
Warp-Proof	Glue	The F. G. Findley Co., Milwaukee, Wis.
Washington Brilliant	Box covers	District of Columbia Paper Mills, Inc., Washington, D. C.
Water-Tite	Waterproof paper	Rexford Paper Co., Milwaukee, Wis.
Waxcote	Wax coated paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Waxfibre	Meat and delicatessen paper	Western Waxed Paper Co., Los Angeles, Calif.
Wax-Lite	Transparent sulphite self sealing bread wrapper	Pollock Paper & Box Co., Dallas, Texas
Waxmaster	Heating and dipping tank for waxes	Aeroil Burner Co., W. New York, N. J.
Wax-Pax	Sandwich bags in packages and bulk	The American Paper Goods Co., Kensington, Conn.
Waxsheen	Highly transparent and glossy cake and candy wrapper	Dixie Wax Paper Co., Inc., Dallas, Texas
Waxsorb	Wax impregnated paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Waxtex	Household roll waxed paper	Marathon Corp., Menasha, Wis.
Weavette	Box paper	Kupfer Bros. Co., New York, N. Y.
Webril	Fibrous material	Kendall Mills, New York, N. Y.
Weigh-Flow **Weigh Right**	Vibrating weighing feeders Automatic scale fillers	Syntron Co., Homer City, Pa. Weigh Right Automatic Scale Co., Joliet, Ill.
Weightograph	Automatic weight recording device	Howe Scale Co., Rutland, Vt.
Weightometer	Automatic conveyor scale	Merrick Scale Mfg. Co., Passaic, N. J.
Weklite	Coated and foil box papers	Hazen Paper Co., Holyoke, Mass.
Weldwood	Plywood	U. S. Plywood Corp., New York, N. Y.
Weldwood Glue	Plastic adhesive	U. S. Plywood Corp., New York, N. Y.
Werthy	Ribbons	W-E-R Ribbon Corp., New York, N. Y.
Wesco	Capper	Scientific Filter Co., New York, N. Y.
Wettsall	Wetting agent	Fuchs & Lang Div., Sun Chemical Corp., New York, N. Y.
Whalehide	Semi-parchmentized deodorized kraft	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Whirlwind	Electric label paster and screw capper	Scientific Filter Co., New York, N. Y.
White Eagle	Bleached deodorized kraft, dry-waxed	Kalamazoo Vegetable Parchment Co., Kalamazoo, Mich.
Whitehall	Dispensers	Food Dispenser Co., Hartford, Conn.
White-Tite	Cylindrical containers	Fibreboard Products Inc., San Francisco, Calif.
Whiz-Tape	Narrow opening tape inserted beneath transparent wrappers	Shellmar Products Corp., Mt. Vernon, Ohio
Whiz Wite	Paper for box wraps and printing	Matthias Paper Corp., Phila., Pa.
Williams Stripe	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Wind-O-Band	Cellulose bands	Armstrong Cork Co., Lancaster, Pa.
Wind-O-Band	Cellulose seal	E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
Windocel	Cellophane window cartons	Brooks & Porter, Inc., New York, N. Y.
Win-Do-Dec	Corrugated for window trimming	Ajax Box Co., Chicago, Ill.
Windorap	Combination transparent and opaque wrappers	Newark Paraffine & Parchment Paper Co., Newark, N. J.
Windoseals	Milk bottle hoods	Reynolds Metals Co., Richmond, Va.
Window-mesh	Mesh cloth between cellulose acetate	The Floyd A. Holes Co., Bedford, Ohio
Windsor	Water-resistant tape	Mid-States Gummed Paper Co., Chicago, Ill.
Winnebago	Kraft, M. F.	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Winnerwite	Box cover paper	Matthias Paper Corp., Phila., Pa.
Wireless	Folded oyster and food pail	Bloomer Bros. Co., Newark, New York State
Wirestrap	Round wire strap	Acme Steel Co., Chicago, Ill.
Witcote	Stripcoat compound	Witco Chemical Co., Chicago, Ill.
Wizard	Marking compound	Markem Machine Co., Keene, N. H.
Wizard Iceproof	Glue for labeling bottles	Midland Glue Products Co., Detroit, Mich.
Wonder	Printing inks, lithographic supplies	International Printing Ink, Div. Interchemical Corp., New York, N. Y.
Wonder	Paper box gums	Stein, Hall & Co., Inc., New York, N. Y.
Wonpreshun	Printing inks	Sigmund Ullman Div., Sun Chemical Corp., Bronx, N. Y.
Woodcraft	Imitation wood paper	The Marvellum Co., Holyoke, Mass.
Woodcraft	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Woodette	Box paper	Kupfer Bros. Co., New York, N. Y.
Worlbeater	Hand mixer	Na-Mac Products Corp., Los Angeles, Calif.
World	Automatic and semi-automatic labelers	Economic Machinery Co., Worcester, Mass.
World's Fair	Box cover paper	Chas. W. Williams & Co., Inc., New York, N. Y.
Wotta Black	Non-scratch inks	E. J. Kelly Co., Subsidiary Sun Chemical Corp., Kalamazoo, Mich.
Wovenkraft	Reinforced waterproof paper	W. Ralston & Co., Inc., Niagara Falls, N. Y.
Wrap-Ade	Heat sealing, sheeting and gluing machines	Wrapade Machine Co., Newark, N. J.
Wrap-DRI	Asphalt laminated paper	Thilmany Pulp & Paper Co., Kaukauna, Wis.
Wrap-O-Matic	Wrapping machines	Lynch Package Machinery Corp., Toledo, Ohio
Wrap-Seal-It	Hand heat sealing iron	Heat Seal-It Co., Phila., Pa.
Wright	Paper drills and punches	Harris-Seybold Co., Cleveland, Ohio
"X" Base	Inks for raised printing	Wood, Nathan & Virkus Co., Inc., Racine, Wis.
X-Crepe	Moistureproof paper	Cincinnati Industries, Inc., Cincinnati (Lockland), Ohio
X-Flex	Synthetic resin cement	Paisley Products, Inc., Chicago, Ill.
X-Ray	Cellulose envelopes	Alexander Herz Co., Inc., New York, N. Y.
Yale	White grocery bags	Consolidated Paper Bag Co., Somerville, Mass.
Yankee Nests	Nest of lock corner wooden boxes	New England Box Co., Greenfield, Mass.
Yar-Der	Inks used with Thibault Everay reflector	Geo. H. Morrill Div., Sun Chemical Corp., New York, N. Y.
Yuletide	Box paper	Kupfer Bros. Co., New York, N. Y.
Zapak	Plastic coatings	Zapon Div., Atlas Powder Co., Stamford, Conn., & N. Chicago, Ill.
Zapon	Industrial finishes	Zapon Div., Atlas Powder Co., Stamford, Conn., & N. Chicago, Ill.
Zaponite	Wood finishes	Zapon Div., Atlas Powder Co., Stamford, Conn., & N. Chicago, Ill.
Zephyr	Carton gluer	E. G. Staude Mfg. Co., St. Paul, Minn.
Zephyr	Tubing for loaves	The Visking Corp., Chicago, Ill.
Zero-Bag	Heat sealable cellophane bag	Yorkville Paper Co. Inc., New York, N. Y.
Zero-Box	Waxed frozen food box	Yorkville Paper Co. Inc., New York, N. Y.
Zero-cel	Cellophane for frozen foods	Yorkville Paper Co., Inc., New York, N. Y.
Zero-Line	Frozen food packaging line	Yorkville Papers Co. Inc., New York, N. Y.
Zero-Net	Stockinette tubing	Yorkville Paper Co., Inc., New York, N. Y.
Zero-Par	Coated vegetable parchment	Yorkville Paper Co. Inc., New York, N. Y.
Zero-Rap	Heat-sealable cellophane	Yorkville Paper Co., Inc., New York, N. Y.
Zero-Seal	Waxed paper	Marathon Corp., Menasha, Wis.
Zip	Ice cream cartons, pails	Fibreboard Products Inc., San Francisco, Calif.
Zip-Strip Seals	Tamper-proof aluminum closures	Guardian Safety Seal Co., Chicago, Ill.
Zip Tape	Cellophane package opening tape	The Dobeckmun Co., Cleveland, Ohio
Zip-Wrap	Cellophane sheet with pull tape attached	The Dobeckmun Co., Cleveland, Ohio
Zyrox	Chlorine containing resins and compounds	Bakelite Corp., New York, N. Y.

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XUM

Alphabetical List of Manufacturers and Addresses

A

A B C Packaging Machine Co., 350 S. Sixth St., Quincy, Ill.
Abana Products, 2500 N. Pulaski Rd., Chicago, Ill.
Ability Mold & Die Works, 1237 N. California, Chicago, Ill.
Accessories Mfg. Co., 127 E. 31st St., Kansas City, Mo.
Accurate Molding Corp., 35-20 48th Ave., Long Island City 1, N. Y.
Ace Carton Corp., 5800 W. 51st St., Chicago 38, Ill.
Ackerman Plastic Molding, 986 E. 200th St., Cleveland 19, Ohio
Acme Backing Corp., Bogart & Meadow Sts., Bklyn, N. Y.
Acme Burlap Bag Co., 42 Emerson Place, Bklyn, N. Y.
Acme Folding Box Co., 200 Lynch St., St. Louis, Mo.
Acme Folding Box Co., Inc., 141 E. 25th St., New York 10, N. Y.
Acme Paper Box Co., 5950 S. State St., Chicago, Ill.
Acme Printing Ink Co., 1315 W. Congress St., Chicago 7, Ill.
Acme Staple Co., 1643 Haddon Ave., Camden, N. J.
Acme Steel Co., 2840 Archer Ave., Chicago 8, Ill.
Acraglas Co., The, 1805 14th St., Santa Monica, Calif.
Adams Paper Co., Wells River, Vt.
Addison Lithographing Co., 245 Hollenbeck St., Rochester, N. Y.
Adhesives Mfrs. Assn. of America, 441 Lexington Ave., New York, N. Y.
Adler Engineering Co., 295 Main St., Hackettstown, N. J.
Adler, H. M. & Co., 305 S. Sharp St., Baltimore, Md.
Advance Industrial Designers, 175 Fifth Ave., New York 10, N. Y.
Advance Molding Corp., 54 W. 21st St., New York, N. Y.
Advanced Closures Corp., 46th & First Aves., Bklyn, N. Y.
Advertising Federation of America, 330 W. 42nd St., New York, N. Y.
Advertising Metal Display Co., 4620 W. 19th St., Chicago 50, Ill.
Advertising Research Foundation, 11 W. 42nd St., New York, N. Y.
Aeroil Products Co., 5701 Park Ave., West New York, N. J.
Air Transport Assn. of America, 1515 Massachusetts Ave., N. W., Washington, D. C.
Ajax Bottle Cap Corp., 1226 Flushing Ave., Bklyn, N. Y.
Ajax Box Co., The, 2210 S. Union Ave., Chicago 16, Ill.
Albert Paper Box Co., Inc., 360 Furman St., Bklyn, N. Y.
Albia Box & Paper Co., Troy, N. Y.
Alcott, John E., 14 College St., Providence 3, R. I.
Alden Products Co., 117 N. Main St., Brockton 64, Mass.
Alderman Paper Box Corp., 31 Exchange St., Rochester 4, N. Y.
Aldine Paper Co., Inc., 535 Fifth Ave., New York 17, N. Y.
Aldrich Pump Co., The, 12 Pine St., Allentown, Pa.
Alexander, Jerome, 50 E. 41st St., New York 17, N. Y.
Alford Cartons, Industrial Ave., Ridgefield Park, N. J.
All American Aircraft Products, Inc., 1350 E. Anaheim, Long Beach, Calif.
Allcolor Co., Inc., 527 Fifth Ave., New York, N. Y.
Allied Barrel Corp., North Seneca St., Oil City, Pa.
Allied Plastics Co., 5225 Wilshire Blvd., Los Angeles, Calif.
Allis-Chalmers Mfg. Co., 1126 S. 70th St., Milwaukee, Wis.
Allvue Container, Inc., 169 Franklin Ave., Bklyn, N. Y.
Alsop Engineering Corp., Mildale, Conn.
Alton Box Board Co., Alton, Ill.
Aluminum Co. of America, 801 Gulf Bldg., Pittsburgh 19, Pa.
Aluminum Container Corp., 551 W. 3rd St., Fulton, N. Y.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Aluminum Seal Co., New Kensington, Pa.
Alvey Conveyor Mfg. Co., 3201 S. Broadway, St. Louis 18, Mo.
Alvey-Ferguson Co., The, 40 Disney St., Oakley, Cincinnati, Ohio.
Amdeco, 122 Fifth Ave., New York, N. Y.
American Aluminum Ware Co., 368–378 Jelliff Ave., Newark, N. J.
American Anode, Inc., 60 Cherry St., Akron, Ohio.
American Assn. of Advertising Agencies, 420 Lexington Ave., New York, N. Y.
American Box Board Co., 5950 W. 51st St., Chicago 38, Ill.
American Can Co., 230 Park Ave., New York 17, N. Y.
American Chemical Society, 1155 16th St., N. W., Washington 6, D. C.
American Coating Mills, Inc., Division St., Elkhart, Ind.
American Colortype Co., 1151 West Roscoe St., Chicago, Ill.
American Cyanamid Co., Plastics Div., 30 Rockefeller Plaza, New York 20, N. Y.
American Decalcomania Co., 4334 Fifth Ave., Chicago 24, Ill.
American Denture Corp., 536 S. E. 6th Ave., Portland, Ore.
American Drug Mfrs. Assn., 1426 G St., Washington, D. C.
American Excelsior Corp., 1000 N. Halsted St., Chicago 22, Ill.
American Flange & Mfg. Co., Inc., 30 Rockefeller Plaza, New York 20, N. Y.
American Folding Box Co., 1901 Washington Ave., St. Louis, Mo.
American Hard Rubber Co., 11 Mercer St., New York, N. Y.
American Home Economics Assn., Mills Bldg., Washington, D. C.
American Institute of Food Distribution, 420 Lexington Ave., New York, N. Y.
American Insulator Corp., New Freedom, Pa.
American Label Cutting Co., 230 W. 17th St., New York, N. Y.
American Lace Paper Co., 4425 N. Port Washington Ave., Milwaukee 12, Wis.
American Machine & Foundry Co., 511 Fifth Ave., New York 17, N. Y.
American Management Assn., 330 W. 42nd St., New York 18, N. Y.
American Marketing Assn., School of Business, Indiana University, Bloomington, Ind.
American Meat Institute, 59 E. Van Buren St., Chicago, Ill.
American Molded Products Co., 1753 N. Honore St., Chicago, Ill.
American Molding Co., 355 Fremont St., San Francisco 5, Calif.
American National Bag & Burlap Co., Inc., 343 Kent Ave., Bklyn 11, N. Y.
American Package Co., 402 Lafayette St., New York, N. Y.
American Paper Bottle Co., 1813 Collingwood Blvd., Toledo, Ohio
American Paper Goods Co., The, 449 Main St., Kensington, Conn.
American Paper & Pulp Assn., 122 E. 42nd St., New York, N. Y.
American Perforator Co., The, 625 W. Jackson Blvd., Chicago, Ill.
American Phenolic Corp., 1830 So. 54th Ave., Cicero P. O., Chicago, Ill.
American Plastics Corp., 225 W. 34th St., New York, N. Y.
American Printing Ink Div., Sun Chemical Corp., 2314 W. Kinzie St., Chicago 12, Ill.
American Products Mfg. Co., 8127–33 Oleander St., New Orleans 18, La.
American Resinous Chemicals Corp., 103 Foster St., Peabody, Mass.
American Sealcone Corp., 1911 Park Ave., New York, N. Y.
American Seal-Kap Corp., 1105 44th Drive, Long Island City, N. Y.
American Society for Testing Materials, 260 S. Broad St., Phila., Pa.
American Spice Trade Assn., 82 Wall St., New York, N. Y.
American Standards Assn., 70 E. 45th St., New York, N. Y.
American Star Cork Co., Inc., 175 N. 9th St., Bklyn 11, N. Y.
American Steel Band Co., P. O. Box 565, Pittsburgh, Pa.
American Tissue Mills, 12 Crescent St., Holyoke, Mass.
American Tri-State Paper Box Co., 808 17th Ave., N. Nashville, Tenn.
American Veneer Package Assn., 2101 K St., N. W., Washington, D. C.
American Waxed Paper Assn., 1532 Lincoln-Liberty Bldg., Phila., Pa.
Ames Bag Co., 1991 E. 66th St., Cleveland, Ohio
Ames Harris Neville Co., 2800 17th St., San Francisco, Calif.
Amos Molded Plastics, Div. of Amos-Thompson Corp., Edinburgh, Ind.
Amos-Thompson Corp., Edinburgh, Ind,
Ams, Max Machine Co., The, Scofield Ave., Bridgeport 5, Conn.
Amsco Packaging Machinery, Inc., 31-31 48th Ave., Long Island City, N. Y.
Analytical Laboratory, The, 921 Bergen Ave., Jersey City, N. J.
Anchor Hocking Glass Corp., 20 Glass Ave., Lancaster, Ohio
Andersen, A. J. Co., 429 W. Superior St., Chicago 10, Ill.
Anderson Box & Basket Co., Inc., 230 Fifth Ave., New York, N. Y.
Anderson, George W. Inc., 36-02 38th St., Long Island City 1, N. Y.
Andrews, O. B. Co., Rossville Blvd., Chattanooga, Tenn.
Andrews, P. L. Corp., 78th & Cooper Ave., Ridgewood Station, Bklyn 27, N. Y.
Anfinsen Plastic Molding Co., Aurora, Ill.
Angelus Paper Box Co., 751 N. Broadway, Los Angeles, Calif.
Angier Corp., Framingham, Mass.
Angier Products, Inc., 120 Potter St., Cambridge, Mass.
Anigraphic Process, Inc., 11 Broadway, New York, N. Y.
Animated Display Creators, 510 First Ave. N., Minneapolis, Minn.
Apex Paper Box Corp., 2318 Southwestern Ave., Chicago, Ill.
Arabol Mfg. Co., The, 110 E. 42nd St., New York 17, N. Y.
Arenco Machine Co., Inc., 25 W. 43rd St., New York 18, N. Y.
Arens, Egmont, 480 Lexington Ave., New York 17, N. Y.
Aridor Closure Div. of Ball Bros.Co., The, 3428 W. 48th Place, Chicago 32, Ill.
Aridye Corp. (subsidiary of Interchemical Corp.), Fair Lawn, N. J.
Arkell Safety Bag Co., 10 East 40th St., New York, N. Y.
Arkell & Smiths, 1941 Mill St., Canajoharie, N. Y.
Armstrong Cork Co., 910 Arch St., Lancaster, Pa.
Armstrong Paint & Varnish Works, 1330 S. Kilbourn Ave., Chicago, Ill.
Arpin Products, Inc., 422 Alden St., Orange, N. J.
Arrow Mfg. Co., Inc., 15th & Hudson Sts., Hoboken, N. J.
Arrow Plastics Corp., 178 River Drive, Passaic, N. J.
Art-Tex, 81 Washington St., New York, N. Y.
Art Tube Co., Inc., 500 Lyons Ave., Irvington 11, N. J.
Artcote Papers, Inc., 390 Coit St., Irvington 11, N. J.
Artisan Plastic Molding Co., 40 Belvidere St., Trenton, N. J.
Artistic Flower Co., 24 E. 21st St., New York 10, N. Y.
Arvey Corp., 3462 N. Kimball Ave., Chicago 18, Ill.
Arwood Can Co., Knoxville, Tenn.
Asco Packing Co., 55 Branford St., Newark 5, N. J.
Ashtabula Corrugated Box Co., The, 3714 Ann Ave., Ashtabula, Ohio
Ashuelot Paper Co., Hinsdale, N. H.
Associated Cooperage Industries of America, 408 Olive St., St. Louis, Mo.
Associated Grocery Mfrs. of America, 205 E. 42nd St., New York, N. Y.
Association of American Railroads, Freight Claim Div., 59 E. Van Buren St., Chicago, Ill.
Association of Canadian Advertisers, Federal Bldg., Toronto, Ont., Canada
Association of Food Distributors, 100 Hudson St., New York, N. Y.
Association of National Advertisers, 285 Madison Ave., New York, N. Y.
Athol Paper Box Co., 349 Main St., Athol, Mass.
Atlanta Box Factory, Inc., 237–9 Whitehall St., Atlanta, Ga.
Atlanta Container Corp., 1 Hunter St., S. W., Atlanta, Ga.
Atlanta Paper Co., 225 Moore St., S. E., Atlanta, Ga.
Atlantic Carton Corp., N. Main & 2nd Sts., Norwich, Conn.
Atlantic Excelsior Co., Inc., 11th Ave. & 29th St., New York, N. Y.
Atlantic Gummed Paper Corp., 1 Main St., Bklyn 1, N. Y.
Atlantic Paper Box Co., 46 Waltham St., Boston, Mass.
Atlantic Paper Box Corp., The, 139 Franklin St., Jersey City, N. J.
Atlantic Plastic & Metal Parts Co., 2730 Grand Ave., Cleveland, Ohio
Atlantic Plastics, Inc., 33–18 57th St., Woodside, N. Y.
Atlas Appliance Corp., 20 Grand Ave., Bklyn, N. Y.
Atlas-Boxmakers, Inc., 2555 W. Diversey Blvd., Chicago 47, Ill.
Atlas Gum & Sizing Co., Inc., 406 Pearl St., New York 7, N. Y.
Atlas Plastic Mfg. Co., Inc., 47 Broadway, Lynbrook, L. I., N. Y.
Atlas Powder Co., Zapon Div., Stamford, Conn.; N. Chicago, Ill.
Attleboro Printing & Embossing Co., Inc., 54 Union St., Attleboro, Mass.
Auburn Button Works, Inc., Auburn, N. Y.

Augusta Bag & Burlap Co., 514 Reynolds St., Augusta, Ga.
Auld-Hampton, Inc., 104 Verona Ave., Newark, N. J.
Ault & Wiborg, Div. of Interchemical Corp., 1754 Dana Ave., Cincinnati 7, Ohio
Autokraft Box Corp., Plant No. 2, Maple Ave., Hanover, Pa.
Automatic Box Co., 17 E. 42nd St., New York, N. Y.
Automatic Paper Box Corp., 1011–25 S. California Ave., Chicago 12, Ill.
Automatic Plastic Products, 1368 Park Ave., Emeryville, Calif.
Automatic Scale Co., Inc., 591 Hudson St., New York 14, N. Y.
Avery Adhesives, 451–453 E. 3rd St., Los Angeles 13, Calif.
Ayers, John W. & Son, Bloomfield, N. J.

B

Babbitt Chemical Specialties Co., 630 Fifth Ave., New York 20, N. Y.
Babcock Box Co., 43 S. Main St., Attleboro, Mass.
Bach, Alfons Associates, 11 E. 44th St., New York, N. Y.
Bachmann Bros., Inc., 1420 East Erie Ave., Phila., Pa.
Bader Bros. Bag Co., 1339 Clinton St., Detroit, Mich.
Badger Merchandising Displays, Inc., 225 W. Capitol Drive, Milwaukee 12, Wis.
Baermann, Walter, 208 Race St., Holyoke, Mass.
Bagpak, Inc., 220 E. 42nd St., New York 17, N. Y.
Bagprint Machinery Corp., 4363 Woodward Ave., Royal Oak, Mich.
Bakelite Corp., 50 E. 42nd St., New York 17, N. Y.
Baker Oil Tools, Inc., P. O. Box 127, Vernon Station, Los Angeles, Calif.
Baker, Willoughby, 2921 Chapman St., Oakland, Calif.
Baldwin, Eli & Son, Inc., 356 W. 18th St., New York, N. Y.
Ball Bros. Co., Muncie, Ind.
Bangor Box Co., P. O. Box 4, Bangor, Me.
Bannon Bag Co., Inc., The, 820 Magazine St., New Orleans, La.
Barber Colman Co., Molded Products Div., Rockford, Ill.
Barden & Robeson Corp., Penn Yan, N. Y.
Bareco Oil Co., Box 2009, Tulsa, Okla.
Barger Box Co., Inc., 802 W. Beardsley Ave., Elkhart, Ind.
Barnes Plastic Co., 439 E. 58th St., Los Angeles, Calif.
Barnes & Reinecke, 230 E. Ohio St., Chicago 11, Ill.
Barrett-Cravens Co., 3255 W. 30th St., Chicago 23, Ill.
Barta-Griffin Co., 72 Commercial St., Worcester, Mass.
Bartlett Label Co., 2135 Portage St., Kalamazoo 29F, Mich.
Battle Creek Bread Wrapping Machine Co., 12th St., Battle Creek, Mich.
Bauer & Black, Div. of the Kendall Co., 2500 S. Dearborn St., Chicago 16, Ill.
Bay State Moulding Co., 1189 Dorchester Ave., Boston, Mass.
Bayer, Herbert, 850 7th Ave., New York, N. Y.
Beacon Container Co., 12 E. 41st. St., New York, N. Y.
Beaman Molded Products Co., 4637 S. E. Hawthorne Blvd., Portland, Ore.
Beck, Charles Machine Co., 414 N. 13th St., Phila., Pa.
Bedford Can Co., 120 Pearl St., Bklyn, N. Y.
Beggs & Graham, 204 Chancellor St., Phila. 6, Pa.
Beier & Co., 409 S. Green St., Chicago 7, Ill.
Belleville Can Co., Belleville, N. J.
Bellisio, Bartolomeo, 373 Fifth Ave., New York, N. Y.
Bemis Bro. Bag Co., 408 Pine St., St. Louis 2, Mo.
Bemiss Jason Co., 111 Townsend St., San Francisco, Calif.
Ben Mont Papers, Inc., Mill St., Bennington, Vt.
Bennett, E. W. & Co., 16th & Utah Sts., San Francisco, Calif.
Bensing Bros. & Deeney, 401 N. Broad St., Phila. 8, Pa.
Benton Harbor Mfg. Co., 4th & Ridford, Benton Harbor, Mich.
Bergwood Molding Co., 425–27 W. 6th Street, Kansas City, Mo.
Berkander, Geo. F. Inc., 891 Broad St., Providence, R. I.
Berkowitz, Leon S., 1343 Arch St., Phila. 7, Pa.
Berles Carton Co., Inc., 86 Fifth Ave., Paterson, N. J.
Berman Bros., Inc., 1501 S. Laflin St., Chicago 8, Ill.
Bernardin Bottle Cap Co., Inc., 329 N. W. 4th St., Evansville 10, Ind.
Bernhard, Lucian, 1 E. 53rd St., New York 22, N. Y.
Berni, Alan & Associates, 7 E. 44th St., New York 17, N. Y.
Bertels Metal Ware Co., Inc., 625 Rutter Ave., Kingston, Pa.
Berwin Paper Corp., Dansville, N. Y.
Bethlehem Steel Co., Bethlehem, Pa.
Betner, Benj. C. Co., Devon, Pa.
Better Packages, Inc., 244 Canal St., Shelton, Conn.
Bicknell & Fuller Paper Box Co., 50 Chardon St., Boston, Mass.
Bielefeld, Herbert Inc., 35 E. Wacker Drive, Chicago, Ill.
Bienfang Paper Co., 220 W. 19th St., New York 11, N. Y.
Bierdeman Paper Box Co., The, 361 W. Superior St., Chicago, Ill.
Bingham Bros. Co., 406 Pearl St., New York 7, N. Y.
Bird & Son, Inc., E. Walpole, Mass.
Birmingham Paper Co., 500 S. 22nd St., Birmingham 3, Ala.
Bischoff, Ernst Co., Inc., 50 E. 42nd St., New York 17, N. Y.
Bisler, G. A. Inc., 5th & Brown Sts., Phila. 23, Pa.
Blake, Moffitt & Towne, 599 Eighth St., San Francisco 3, Calif.
Bloomer Bros. Co., Norton St., Newark, New York State
Blue River Plastics Mfg. Corp., 329 Canal St., New York, N. Y.
Blum, Emery & Co., Inc., 251 Fifth Ave., New York, N. Y.
Blum Folding Paper Box Co., Inc., 79 Bogart St., Bklyn 6, N. Y.
Blumenthal, Margaret, 10 W. 93rd St., New York, N. Y.
Boldt Bag Co., The, 2301 Sabine St., P. O. Box 2064, Houston 1, Texas
Bolta Co., The, 151 Canal St., Lawrence, Mass.
Bond Crown & Cork Co., Div. of Continental Can Co., Inc., 16th & Locust Sts., Wilmington, Del.
Bones & Mayer, 3915 Powelton Ave., Phila., Pa.
Boonton Molding Co., 326 Myrtle Ave., Boonton, N. J.
Boothby Fibre Can Div., Continental Can Co., Inc., Roxbury, Mass.
Bostitch, Inc., 500 Duane St., East Greenwich, R. I.
Boston Drinking Cup Co., High & Maverick Sts., Dedham, Mass.
Bosworth, M. M. Co., Memphis, Tenn.
Bowser-Morner Testing Laboratories, 141 Bruen St., P. O. Box 51, Dayton 1, Ohio
Box Novelties, Inc., 729 Broadway, New York, N. Y.
Box Shop, Inc., 373 Lexington Ave., New Haven, Conn.
Braden-Sutphin Ink Co., 3800 Chester Ave., Cleveland 14, Ohio
Bradley, A. J. Mfg. Co., 9–11 43rd Ave., Long Island City, N. Y.
Bradley & Gilbert Co., The, 646–652—7th St., Louisville, Ky.
Bradner Smith & Co., 333 S. Desplaines St., Chicago, Ill.
Brandau-Craig-Dickerson Co., 304–06 Tenth Ave., S., Nashville, Tenn.
Brass Goods Mfg. Corp., 345 Eldert St., Bklyn, N. Y.
Braun, W. Co., 300 N. Canal St., Chicago 6, Ill.
Breen, Frederick Murray Inc., 6 E. 45th St., New York, N. Y.
Brever Molding Co., 24 N. Racine Ave., Chicago, Ill.
Brick & Ballerstein, 153 E. 24th St., New York, N. Y.
Bridgeport Metal Goods Mfg. Co., 365 Cherry St., Bridgeport 5, Conn.
Bridgeport Moulded Products, Inc., Box 3276, Barnum Station, Bridgeport, Conn.
Bridgeport Paper Box Co., 304 Kossuth St., Bridgeport, Conn.
Bridgeport Testing Laboratory, Inc., 675 Knowlton St., Bridgeport, Conn.
Brill-Monfort Co., Inc., 77 Washington Ave., Bklyn, N. Y.
Bristol Board Mfrs. Group (APPA), 122 E. 42nd St., New York, N. Y.
Brockway Glass Co., Inc., 1047 Seventh Ave., Brockway, Pa.
Bronzart Metals Co., 220 Fifth Ave., New York, N. Y.
Brooklyn Standard Bag Corp., 521 Fifth Ave., New York 17, N. Y.
Brooks Bank Note Co., 140 Wilbraham Ave., Springfield 9, Mass.
Brooks Paper Co., Security Bldg., St. Louis, Mo.
Brooks & Porter, Inc., 304 Hudson St., New York 13, N. Y.
Brown Bag Filling Machine Co., The, 10 Main St., Fitchburg, Mass.
Brown & Bailey Co., 417 N. 8th St., Phila. 23, Pa.
Brown-Bridge Mills, Inc., The, 1937 Water St., Troy, Ohio
Brown & Brown, 56 Congress St., Mobile, Ala.
Brown Co., 404 Commercial, Portland, Maine
Bryant Electric Co., Bridgeport, Conn.
Buck Glass Co., The, 841 E. Fort Ave., Baltimore, Md.
Buckeye Stamping Co., 555 Marion Rd., Columbus 7, Ohio
Buckley, C. E. Co., 34 Tremaine St., Leominster, Mass.
Buedingen, Ferdinand Co., Inc., 240 St. Paul St., Rochester, N. Y.
Buedingen, William & Sons, 1500 Clinton Ave., N., Rochester, N. Y.
Buffinton, F. H. Co., 668 Eddy St., Providence, R. I.
Bulkley, Dunton & Co., Inc., 295 Madison Ave., New York 17, N. Y.
Bunn, B. H. Co., 7605 Vincennes Ave., Chicago, Ill.
Burd & Fletcher Co., 321 W. 7th St., Kansas City 6, Mo.
Burdick & Son, Inc., Albany, N. Y.
Burgess Fastening Co., The, 1220 W. 9th St., Cleveland 6, Ohio
Burka Bag Co. of Texas, Commerce Bldg., Galveston, Texas
Burnett, R. L. Co., 815–817 E. Commerce St., San Antonio 6, Texas
Burrows Paper Corp., Little Falls, N. Y.
Burt, F. N. Co., Inc., 514 Seneca St., Buffalo, N. Y.
Burt Machine Co., 401–3 E. Oliver St., Baltimore, Md.
Burton Mfg. Co., 3855 N. Lincoln Ave., Chicago, Ill.
Buschman, E. W. Co., Inc., The, Clifton Ave. & B. & O. R.R., Cincinnati, Ohio
Buser Corp., P. O. Box 2020, Paterson, N. J.
Bushwick Can Co., Inc., 723 Henry St., Bklyn, N. Y.
Butterfield, T. F. Inc., 56 Rubber Ave., Naugatuck, Conn.
Butterfield-Barry Co., Inc., 174 Hudson St., New York 13, N. Y.
Button Corp. of America, 40 Dickerson St., Newark, N. J.

C

Cadillac Can Co., Mary St., Mt. Clemens, Mich.
Cadillac Products, Inc., 550 W. Lafayette St., Detroit, Mich.
Caldwell Products, Inc., 142 W. 24th St., New York, N. Y.
California Co-Operative Packaging Assn., Hollingsworth Bldg., Los Angeles 14, Calif.
California Ink Co., Inc., The, 545 Sansome St., San Franciso, Calif.
California Pacific Plastic Co., 2225 Sunset Blvd., Los Angeles, Calif.
California Plastic Moulding Co., 1702 E. 61st St., Los Angeles, Calif.
California Plastics Co., 580 Market St., San Francisco, Calif.
California Testing Laboratories, Inc., 1429 Santa Fe Ave., Los Angeles, Calif.
Calumet Carton Co., 14575 Lincoln St., Harvey, Ill.
Calvert Lithographing Co., 2100 Grand River Ave. W., Detroit 1, Mich.
Cambridge Instrument Co., Inc., 3732 Grand Central Terminal, New York, N. Y.
Cambridge Paper Box Co., 196 Broadway, Cambridge, Mass.
Cameo Die and Label Co., 154 W. 14th St., New York 11, N. Y.
Cameron Can Machinery Co., Div., Continental Can Co., Inc., 241 N. Ashland Ave., Chicago 7, Ill.
Cameron Machine Co., 61 Poplar St., Bklyn 2, N. Y.
Campbell Box & Tag Co., 903 S. Main St., South Bend 23, Ind.
Canister Co., Inc., The, N. Broad St., Phillipsburg, N. J.
Can Manufacturers Institute, 60 E. 42nd St., New York, N. Y.
Canning Machinery & Supplies Assn., 827 Bedford Road, Battle Creek, Mich.
Cans, Inc., 3217 W. 47th Place, Chicago, Ill.
Capac Mfg. Co., Capac, Mich.
Capitol Paper Box Co., Inc., 1300 6th St., N. Bergen, N. J.
Capitol Printing Ink Co., Inc., 806 Channing Pl., N. E., Washington, D. C.
Carbide & Carbon Chemicals Corp., 30 E. 42nd St., New York 17, N. Y.
Carbin Bottle Cap Corp., 1155 Manhattan Ave., Bklyn, N. Y.
Cardboard Manufacturers Assn., 122 E. 42nd St., New York, N. Y.
Cardinal Corp., The, Evansville, Ind.
Carlson Autopress Corp., Rockledge, Pa.
Carlson, John P. Inc., 420 Carroll St., Bklyn 15, N. Y.
Carnegie-Illinois Steel Corp., Carnegie Bldg., Pittsburgh 30, Pa.
Carolina Paper Board Corp., P. O. Box 1631, Charlotte, N. C.
Carpenter Container Corp., 137–147 41st St., Bklyn 32, N. Y.
Carr-Lowrey Glass Co., Baltimore 3, Md.
Carter Engineering Co., 290 Adams Bldg., Danville, Ill.
Carter, Joseph, 520 N. Michigan Ave., Chicago 11, Ill.
Carter, William Co., Highland Ave., Needham Heights, Mass.
Carthage Paper Makers, Inc., 1 Front St., Carthage, N. Y.
Carton Service, Inc., Franklin Ave., Shelby, Ohio
Cartoning Machinery Co. (See U. S. Automatic Box Machinery Co., Inc.)
Casco Paper Box Co., Inc., 68 Cross Street, Portland, Maine
Casselman, T. & E. Inc., 356–362 W. 18th St., New York, N. Y.
Catalin Corp., 1 Park Ave., New York 16, N. Y.
Cavalier Cap Corp., 507 Botetourt St., Norfolk, Va.
Celanese Plastics Corp., 180 Madison Ave., New York 16, N. Y.
Cello-Masters, Inc., 1155 Randall Ave., New York, N. Y.
Celloprint, Inc., 200 Varick St., New York 14, N. Y.
Cellulose Packaging Corp., 235 E. 42nd St., New York, N. Y.
Cellulose Wadding Products, Inc., Garwood, N. J.
Celluplastic Corp., 50 Ave. L, Newark 5, N. J.
Cellusuede Products, Inc., 2107 Kiswaukee St., Rockford, Ill.
Cellutin Corp., The, Dwight St., Holyoke, Mass.
Celon Co., The, 2034 Pennsylvania Ave., Madison 4, Wis.
Central Bag & Burlap Co., 4513 S. Western Blvd., Chicago, Ill.
Central Can Co., 2415 W. 19th St., Chicago 8, Ill.
Central Can Co., Inc., 1104–1110 Santa Fe, Kansas City 7, Mo.

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Central Carton Co., 920 Summer St., Cincinnati, Ohio
Central Die Casting & Mfg. Co., 2935 W. 47th St., Chicago, Ill.
Central Fibre Products Co., 111 W. Washington St., Chicago, Ill.
Central Lithograph Co., The, 113 St. Clair Ave. N. E., Cleveland 14, Ohio.
Central Machine Works Co., 1234 Central Ave., N. E., Minneapolis, Minn.
Central Ohio Paper Co., The, 226 N. 5th St., Columbus 16, Ohio
Central Paper Box Co., 2911–43 Belleview Ave., Kansas City, Mo.
Central Paper Co., Manitowoc St., Menasha, Wis.
Central Paper Co., Inc., 2404 Lakeshore Drive, Muskegon, Mich.
Central Paper Corp., Muskegon, Mich.
Central Process Corp., 1401 S. Circle Ave., Forest Park, Ill.
Central States Paper & Bag Co., 2600 N. Broadway, St. Louis 6, Mo.
Central Waxed Paper Co., 5659 W. Taylor St., Chicago, Ill.
Century Ribbon Mills, 80 Madison Ave., New York, N. Y.
Ceramic Decorating Co., 4651 Sheila St., Los Angeles 22, Calif.
Chain Belt Co., 1600 W. Bruce St., Milwaukee, Wis.
Chambon, L. Corp., 320 W. 46th St., New York 19, N. Y.
Champion Paper & Fibre Co., The "B" St., Hamilton, Ohio
Champlain Co., Inc., 88 Llewellyn Ave., Bloomfield, N. J.
Chase Bag Co., 309 W. Jackson Blvd., Chicago 6, Ill.
Chase, H. & L., 267 Atlantic Ave., Boston, Mass.
Chasen, Alex & Co., Columbia Ave. & Randolph St., Phila., Pa.
Chaspec Mfg. Co., 295 Lafayette St., New York 12, N. Y.
Chatfield Paper Co., 227 W. 3rd St., Cincinnati, Ohio
Chemaco Corp., 46 Snyder Ave., Berkeley Heights, N. J.
Chemical Color & Supply Div., Sun Chemical Corp., 2820 Grand Ave., Chicago 12, Ill.
Chemical Paper Mfg. Co., Jackson St., Holyoke, Mass.
Chemical Plastics, Inc., 7301 W. Lake St., Minneapolis 16, Minn.
Cheron, Pierre J., 65 Locust St., Stratford, Conn.
Chesapeake Can Co., Inc., Crisfield, Md.
Chesapeake Paper Board Co., The, Baltimore, Md.
Chicago Cardboard Co., 670 Washington Blvd., Chicago 6, Ill.
Chicago Carton Co., 4200 S. Crawford Ave., Chicago 32, Ill.
Chicago Die Mold Mfg. Co., 1735 Diversey Pkwy., Chicago, Ill.
Chicago Gum Tape Co., 855 W. Adams St., Chicago 7, Ill.
Chicago Label & Box Co., 312 N. May St., Chicago, Ill.
Chicago Molded Products Corp., 1020 N. Kolmar Ave., Chicago 51, Ill.
Chicago Paper Co., 801 S. Wells St., Chicago 7, Ill.
Chicago Plastic Mfg. Co., 4029 W. Kinzie St., Chicago, Ill.
Chicago Printed String Co., 2320 Logan Blvd., Chicago, Ill.
Chipman, Richmond Lane, Jr., 30-A N. Mountain Ave., Montclair, N. J.
Chirpe, W. Rodney, 185 N. Wabash Ave., Chicago, Ill.
Chisholm-Ryder Co. of Pa., E. Chestnut St., Hanover, Pa.
Cinch Mfg. Corp., 2335 W. VanBuren St., Chicago, Ill.
Cincinnati Advertising Products Co., 3274 Beekman St., Cincinnati, Ohio
Cincinnati Industries, Inc., (Lockland) Cincinnati 15, Ohio
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati 6, Ohio
Cin-Made Corp., The, 3rd & Eggleston Aves, Cincinnati 2, Ohio
Claff, M. B. & Sons, Inc., 31 West St., Randolph, Mass.
Claremont Paper Co., Inc., 342 Madison Ave., New York, N. Y.
Claremont Waste Mfg. Co., 169 Main St., Claremont, N. H.
Claremould Plastics Co., 135–37–39 Jackson St., Newark, N. J.
Clark, Geo. V. Co., Inc., 26-15 4th St., Astoria, L. I., N. Y.
Clark, J. L., Mfg. Co., 23rd Ave. at 6th St., Rockford, Ill.
Clark Box Co., The, 436 Main St., Danbury, Conn.
Clark Stek-O Corp., 1631 Dewey Ave., Rochester 13, N. Y.
Clarke Can Co., 12th & Fitzwater St., Phila., Pa.
Clarke, Rene, 247 Park Ave., New York, N. Y.
Clarvan Corp., 712 W. Michigan St., Milwaukee 1, Wis.
Cleaveland Lab. & Mfg. Co., Inc., Peapack, N. J.
Cleveland Container Co., The, 10630 Berea Rd., Cleveland 2, Ohio
Cleveland Lathe & Machine Co., 5511 Euclid Ave., Cleveland 3, Ohio
Cleveland Plastics, Inc., 1611 E. 21st St., Cleveland 14, Ohio
Clifton Paper Board Co., Clifton, N. J.
Climax Mfg. & Molding Corp., 315 Reynolds Place, S. W., Canton, Ohio
Clogston Paper Box Co., 102 Hill St., New Haven, Conn.
Clover Box & Mfg. Co., Inc., 818 E. 140th St., New York 54, N. Y.
Clover Leaf Paint & Varnish Corp., 43-43 Vernon Blvd., Long Island City, N. Y.
Coated & Processed Paper Assn., 1002 Union Trust Bldg., Providence 3, R. I.
Codie Kay, 1139 San Julian St., Los Angeles 15, Calif.
Cofax Corp., The, 381 Sunrise Highway, Lynbrook, N. Y.
Collapsible Tube Manufacturers Assn., 19 W. 44th St., New York 18, N. Y.
Collura, Francesco, 1 E. 53rd St., New York, N. Y.
Colonial Envelope Co., 24 E. 22nd St., New York, N. Y.
Coloroid Co., Inc., W. 58th & Walworth, Cleveland, Ohio
Colton, Arthur Co., 2602 E. Jefferson Ave., Detroit 7, Mich.
Colt's Patent Fire Arms Mfg. Co., 17 Van Dyke Ave., Hartford, Conn.
Columbia Box Board Mills, Inc., Chatham, N. Y.
Columbia Paper Box Co., Inc., 1st & Louisiana Ave., N. W., Washington 1, D. C.
Columbia Protektosite Co., Inc., 631 Central Ave., Carlstadt, N. J.
Columbia Specialty Co., Inc., 6301 Eastern Ave., Baltimore, Md.
Columbus Coated Fabrics Corp., 1280 N. Grant Ave., Columbus 16, Ohio
Columbus Laboratories, The, 31 N. State St., Chicago, Ill.
Columbus Paper Box Co., Inc., 344 W. Town St., Columbus 8, Ohio
Columbus Plastic Products, Inc., 519 Dublin Ave., Columbus 15, Ohio
Comet Envelope & Paper Co., Inc., 5 E. 17th St., New York, N. Y.
Commercial Paste Co., The, 504 Buttles Ave., Columbus 8, Ohio
Commercial Printers, Inc., 1039 13 St., Columbus, Ga.
Commonwealth Plastic Co., 140 Adams St., Leominster, Mass.
Compo-Site Plastic Division, E. S. Lowe Co., Inc., 85 5th Ave., Paterson 4, N. J.
Compressed Paper Box Corp., 128 Thompson St., Bridgeport, Conn.
Condon, Frank, 25 Broadway, New York, N. Y.
Conneaut Can Co., The, Whitney Road, Conneaut, Ohio
Connecticut Hard Rubber Co., 407 East St., New Haven, Conn.
Connecticut Plastic Products Co., 124 N. Elm St., Waterbury, Conn.
Consolidated Box Co., Inc., 3007 Granada St., Tampa, Fla.
Consolidated Fruit Jar Co., New Brunswick, N. J.
Consolidated Lithographing Corp., 1013 Grand St., Bklyn 6, N. Y.
Consolidated Molded Plastics Corp., Scranton, Pa.
Consolidated Packaging Machinery Corp., 1400 West Ave., Buffalo 13, N. Y.
Consolidated Paper Co., E. First St., Monroe, Mich.
Consolidated Paper & Box Mfg. Co., 413 E. Canal St., Richmond, Va.
Consolidated Paper Bag Co., 561 Windsor St., Somerville, Mass.
Consolidated Paper Box Co., 6 Vernon St., Somerville, Mass.
Consolidated Stamp Mfg. Co., 15 Dey St., New York, N. Y.
Consolidated Water & Power Co., Wisconsin Rapids, Wis.
Container Company, The, Div. of Continental Can Co., Inc., 965 S. Glenn St., Van Wert, Ohio
Container Corporation of America, 111 W. Washington St., Chicago 2, Ill.
Container Equipment Corp., 204 Riverside Ave., Newark 4, N. J.
Container Manufacturers Guild, 450 Seventh Ave., New York, N. Y.
Container Testing Laboratories, Inc., 45 E. 22nd St., New York, N. Y.; 112 W. Kinzie St., Chicago 10, Ill.; 151 New Montgomery St., San Francisco, Calif.
Continental Bag Specialties Corp., 601 W. 26th St., New York, N. Y.
Continental Can Co., Inc., 100 E. 42nd St., New York 17, N. Y.
Continental Can Co., Plastics Div., Cambridge, Ohio
Continental Container Corp. (See Scandore Paper Box Co.)
Continental Folding Paper Box Co., Inc., Ridgefield, N. J.
Continental Lithograph Corp., 952 E. 72nd St., Cleveland, Ohio
Continental Paper Co., Industrial Ave., Ridgefield Park, N. J.
Continental Paper Products Co., 1000 W. Louisiana Ave., Denver 9, Colo.
Continental Plastics Corp., 308 W. Erie St., Chicago, Ill.
Converter Corp., 530 Main St., Clinton, Mass.
Cooper, D. C. Co., 1467–69 S. Michigan Ave., Chicago 5, Ill.
Cooperative Food Distributors of America, 506 Shoreham Bldg., Washington, D. C.
Copeland Displays, Inc., 244 W. 23rd St., New York, N. Y.
Cordiano Can Co., Inc., 20 Grand Ave., Bklyn, N. Y.
Cork Institute of America, 25 W. 43rd St., New York 18, N. Y.
Corn Products Refining Co., 17 Battery Place, New York, N. Y.
Cornell Wood Products Co., 230 N. Michigan Ave., Chicago, Ill.
Corning Glass Works, Corning, N. Y.
Corro-Lith Corp., 44-35 21st St., Long Island City, N. Y.
Corrugated Box Distributors Assn., Inc., 450 Seventh Ave., New York, N. Y.
Cottonluxe Mfg. Co., 597 E. 137th St., New York 54, N. Y.
Cottrell, C. B. & Sons, Co., Claybourn Div., 3713 N. Humboldt Ave., Milwaukee 1, Wis.
Coughlin Mfg. Co., 699 E. 132nd St., New York 54, N. Y.
Courier Journal Job Printing Co., 324 W. Liberty, Louisville, Ky.
Cournand, E. L. Inc., 285 Madison Ave., N. Y.
Cowles, Harold A. Box & Display Co., 163 St. Paul St., Rochester, N. Y.
Coy Paper Co., Claremont, N. H.
Craftsman Label Co., 120 W. 20th St., New York, N. Y.
Craven-Whittaker Co., 215 Georgia Ave., Providence, R. I.
Crawford, John W. Co., 160 Varick St., New York, N. Y.
Creative Printmakers Inc., 200 Varick St., New York 11, N. Y.
Crescent Box Corp., 621 E. Erie Ave., Phila., Pa.
Crescent Burlap Bag Co., 4124 Toulouse St., New Orleans 6, La.
Crescent Ink & Color Co. of Pa., 464 N. 5th St., Phila. 23, Pa.
Criterion Paper Corp., 799 Washington St., New York 14, N. Y.
Croasdale & deAngelis, Eagle & Lawrence Rds., Upper Darby, Pa.
Croce, Isabel M., 137 E. 38th St., New York, N. Y.
Crocker-Union, 735 Harrison St., San Francisco, Calif.
Crompton-Adelphia, John Corp., 145 W. Columbia Ave., Phila., Pa.
Cromwell Paper Co., The, 4801 S. Whipple St., Chicago, Ill.
Crook Paper Box Co., 110–120 E. 10th Ave., N., Kansas City, Mo.
Cross Paper Products Corp., 2587–2597 3rd Ave., New York 51, N. Y.
Crowell Corp., The, Yorklyn, Del.
Crown Can Co., Erie Ave. & H St., Phila., Pa.
Crown Cork & Seal Co., Eastern & Kresson Sts., Baltimore, Md.
Crown Cork Specialty Corp., Div. of Crown Cork & Seal Co., Decatur, Ill.
Crown Manufacturers Assn. of America, 218 Munsey Bldg., Washington, D. C.
Crown-Willamette Paper Co., 343 Sansome St., San Francisco, Calif.
Crown Zellerbach Corp., 343 Sansome St., San Francisco, Calif.
Crunden, Martin Mfg. Co., 2nd & Gratiot St., St. Louis, Mo.
Cruver Mfg. Co., 2456–60 W. Jackson Blvd., Chicago 12, Ill.
Cruze, Charles Co., 2008 W. 7th St., Los Angeles 5, Calif.
Crystal Bag Co., Chickamauga, Ga.
Crystal Tissue Co., Middletown, Ohio
Crystal Transparent Corp., 136 W. 21st St., New York 11, N. Y.
Crystal Tube Corp., 538 S. Wells St., Chicago 7, Ill.
Cummer Graham Co., Paris, Texas
Cupples Co., 7th & Spruce Sts., St. Louis, Mo.
Cupples-Hesse Corp., 4175 N. Kingshighway, St. Louis 15, Mo.
Curtis, S. & Son, Inc., Sandy Hook, Conn.
Cushman & Denison Mfg. Co., 133 W. 23rd St., New York, N. Y.
Cutler-Hammer, Inc., 315 N. 12th St., Milwaukee 1, Wis.

D

D & W Tool Co., 601 E. Broadway, Glendale, Calif.
D'Addario, Thomas, 55 W. 42nd St., New York 18, N. Y.
Danbury Square Box Co., The, Elmwood Pl., Danbury, Conn.
Daniels Mfg. Co., 114 W. Kemp St., Rhinelander, Wis.
Darr, Harold W. Associates, 2108 Foshay Tower, Minneapolis, Minn.
Datz Mfg. Co., 537–41 N. 3rd St., Phila., Pa.
Davies Can Co., The, 872 E. 72nd St., Cleveland, Ohio
Davies, Harry Molding Co., 1428 N. Wells St., Chicago 10, Ill.
Davies, Helen & Associates, 39 E. 35th St., New York, N. Y.
Daving Paper Products Co., Inc., 540 Osborne St., Bklyn 12, N. Y.
Davis, Joseph Plastics Co., Schuyler Ave., Foot of Quincy Ave., Arlington, N. J.
Davison, Geo. M., 50 E. 42nd St., New York, N. Y.
Davison Chemical Corp., The, 20 Hopkins Place, Baltimore 3, Md.
Dayton Insulating Molding Co., 207 E. 6th St., Dayton, Ohio
Dean, Charles C. S., 521—5th Ave., New York, N. Y.
Decorated Containers Co., 1478 Chestnut Ave., Hillside, N. J.
Decotone Products, Div. Fitchburg Paper Co., Fitchburg, Mass.
Deerfield Glassine Co., Monroe Bridge, Mass.
Deisroth, W. H. Co., Inc., S. E. Cor. 3rd & Cambria Sts., Phila., Pa.
Dejonge, Louis & Co., 345 Broadway, New York, N. Y.

Delman Paper Box Co., The, 419 W. 5th St., Cincinnati, Ohio
Delta Paper Boxes, Inc., 34 Hubert St., New York 13, N. Y.
DeNina, James Andrew, 509 5th Ave., New York 17, N. Y.
Dennison Mfg. Co., Framingham, Mass.
Densen-Banner Co., Ridgefield Park, N. J.
Design Center, Inc., 132-33 40th Rd., Flushing, L. I., N. Y.
Designers for Industry, Inc., 2915 Detroit Ave., Cleveland 13, Ohio
Designs, Inc., 2027 83rd St., N. Bergen, N. J.
Desky, Donald, 630 5th Ave., New York, N. Y.
Detecto Scales, Inc., 1 Main St., Bklyn, N. Y.
Detroit Label Co., 642 Beaubien St., Detroit 26, Mich.
Detroit Macoid Corp., 12345 Cloverdale Ave., Detroit, Mich.
Detroit Sulphite & Paper Co., 9125 W. Jefferson Ave., Detroit 17, Mich.
Detroit Testing Laboratory, The, 554 Bagley Ave., Detroit, Mich.
Dewey & Almy Chemical Co., 62 Whittemore Ave., Cambridge 40, Mass.
Dexter, C. H. & Sons, Inc., 100 Canal, Windsor Locks, Conn.
Dexter Folder Co., 330 W. 42nd St., New York, N. Y.
Diagraph-Bradley Stencil Machine Corp., 3745 Forest Park Blvd., St. Louis, 8, Mo.
Diamond Paper Box Co., Inc., 30 Somerton St., Rochester, N. Y.
Diamond Paper Mills Co., Inc., 205 E. 42nd St., New York, N. Y.
Diamond Straw & Machine Co., 114 E. 16th St., New York 3, N. Y.
Diaphane Bag Corp. of Pa., 1934 Arch St., Phila. 3, Pa.
Dickerman Box Co., 36 Landsdowne St., Cambridge, Mass.
Diemolding Corp., Rasbach St., Canastota, N. Y.
Dillon-Beck Mfg. Co., 103 Montgomery Ave., Irvington, N. J.
Dimco Plastics, 207 E. 6th St., Dayton 2, Ohio
Diorama Corp. of America, 410 E. 91st St., New York, N. Y.
Disbrow Mfg. Co., Inc., The, 16-34 Nesbitt St., Newark, N. J.
Display Finishing Co., Inc., 21-16 44th Rd., Long Island City, N. Y.
Display Guild, 85-09 57th Ave., Elmhurst, Queens, N. Y.
Displayers, The, 239 E. 56th St., New York 22, N. Y.
District of Columbia Paper Mills, Inc., Potomac & K Sts., N. W., Washington 7, D. C.
Ditch, Ruth M., 813 Mart Bldg., St. Louis, Mo.
Dix, J. J. Inc., 829 E. 134th St., New York, N. Y.
Dixie Cup Co., 24th & Dixie Ave., Easton, Pa.
Dixie Wax Paper Co., P. O. Box 5116, Dallas 2, Texas
Dobeckmun Co., The, Box 6417, Cleveland 1, Ohio
Dodge Cork Co., Inc., 1009 Shippen St., Lancaster, Pa.
Dodge, E. F. Paper Box Co., 124 Central St., Leominster, Mass.
Dohner & Lippincott, 500 5th Ave., New York, N. Y.
Dorfman, A. Co., Inc., 59 W. 19th St., New York, N. Y.
Dorland International-Pettingell & Fenton, Inc., 247 Park Ave., New York, N. Y.
Double Duty Products, Inc., W. 58th & Walworth Ave., Cleveland 2, Ohio
Dow Chemical Co., The, Midland, Mich.
Dowd, M. S., Carton Co., 162 Barbour St., Hartford, Conn.
Drell Novelty Mfg. Co., The, 519 8th Ave., New York 18, N. Y.
Driggs Paper Products Corp., 305 Boerum St., Bklyn, N. Y.
Driscoll, Martin & Co., 610 Federal St., Chicago, Ill.
Drug Package, Inc., 2419 Glasgow Ave., St. Louis, Mo.
Dumas Laboratory, The, Five Ivy St. Bldg., Atlanta, Ga.
Dunn Sulphite Paper Co., 218 Riverview St., Port Huron, Mich.
Dunn, Thomas W. Co., 546 Greenwich St., New York, N. Y.
Dunne, Liam, 299 Madison Ave., New York 17, N. Y.
Du Pont de Nemours, E. I. & Co., Inc., Wilmington 98, Del.
Durez Plastics & Chemicals, Inc., N. Tonawanda, N. Y.
Durite Plastics, Inc., 5000 Summerdale Ave., Phila. 24, Pa.
Du-Tone Ribbon Corp., 511 E. 72nd St., New York, N. Y.

E

Eagle Can Co., 356 Mystic Ave., Somerville, Mass.
Eagle Paper Box Co., 1826 6th St., Detroit, Mich.
Eagle Paper Box Co., 720 E. 11th St., New York, N. Y.
Eagle Paper Box Mfg. Co., 1755 N. Monitor Ave., Chicago, Ill.
Eagle Plastics Corp., 23-10 Bridge Plaza S., Long Island City, N. Y.
Eagle Printing Ink Div., Sun Chemical Corp., 100 6th Ave., New York 13, N. Y.
Earl, M. J. Co., Inc., Reading, Pa.
Earlville Paper Box Co., Earlville, N. Y.
East Central Wooden Box Assn., 23 & Smallman Sts., Pittsburgh, Pa.
Eastern Can Co., Inc., 649 Kent Ave., Bklyn, N. Y.
Eastern Cap & Closure Corp., Baltimore, Md.
Eastern Display Corp., 111 Bleecker St., New York 12, N. Y.
Eastern Lithographers Assn., 110 E. 42nd St., New York, N. Y.
Eastern Plastics, Inc., 3000 Penn Ave., Pittsburgh 1, Pa.
Eastern Wooden Box Assn., 80 Boylston St., Boston, Mass.
Eastman Kodak Co., 343 State St., Rochester 4, N. Y.
Eby, Hugh H. Inc., 4700 Stenton Ave., Phila., Pa.
Eclipse Moulded Products Co., 5150 N. 32nd St., Milwaukee 9, Wis.
Economic Machinery Co., 60 Freemont St., Worcester, Mass.
Economy Box & Pie Plate Co., Marion, Ind.
Economy Fuse & Manufacturing Co., 2717 N. Greenview Ave., Chicago, Ill.
Economy Novelty & Printing Co., 225 W. 39th St., New York 18, N. Y.
Eddy Paper Corp., The, 919 N. Michigan Ave., Chicago, Ill.
Eden Paper Co., Lancaster, Pa.
Edwards & Deutsch Lithographing Co., 2320–40 S. Wabash Ave., Chicago, Ill.
Eggerss-O'Flying Co., 15th & Leavenworth, Omaha 2, Neb.
Egyptian Lacquer Mfg. Co., The, 1270 6th Ave., New York 20, N. Y.
Ehlbert Products, 844 W. Adams St., Chicago, Ill.
Einson-Freeman Co., Inc., Staff & Borden Aves., Long Island City, N. Y.
Elberta Crate & Basket Co., Tallahassee, Fla.
Electric Auto-Lite Co., Bay Mfg. Div., Morton St., Bay City, Mich.
Electric City Box Co., 795–825 Woodlawn Ave., Buffalo 11, N. Y.
Elgin Mfg. Co., 200 Brook St., Elgin, Ill.
Ellis, Geo. D. & Sons, Inc., 309 N. 3rd St., Phila. 6, Pa.
Elwell-Parker Electric Co., 4525 St. Clair Ave., Cleveland 14, Ohio
Emeloid Co., Inc., The, 287–291 Laurel Ave., Arlington, N. J.
Empire Box Corp., 919 N. Michigan Ave., Chicago, Ill.
Empire Box Corp., 70 Outwater Lane, Garfield, N. J.
Empire Can Corp., 228 Ashford St., Bklyn, N. Y.
Empire Lithographing Co., Inc., 333 Hudson St., New York, N. Y.
Empire Metal Cap Co., Inc., 32 33rd St., Bklyn, N. Y.
Enbee Transparent Specialty Co., 30 W. 39th St., New York, N. Y.
Envelope Manufacturers Assn. of America, 19 W. 44th St., New York 18, N. Y.
Eppy, Samuel Inc., 254 W. 31st. St., New York, N. Y.
Epsen Lithographing Co., 20th & Webster Sts., Omaha, Neb.
Equitable Paper Bag Co., Inc., 47-00 31st Place, Long Island City 1, N. Y.
Erie Corrugated Box Co., The, Erie, Pa.
Erie Plastics Co., 1304 Cranberry St., P. O. Box 515, Erie, Pa.
Erie Resistor Corp., Plastics Div., 640 W. 12th St., Erie, Pa.
Ermold, Edward Co., 652 Hudson St., New York 14, N. Y.
Ertel Engineering Corp., 40 Mill St., Kingston, N. Y.
Erving Paper Mills, Erving, Mass.
Erwin Bag Co., Houston, Texas
Essex Corp., Harris St., Charlottesville, Va.
Estes, E. B. & Sons, Inc., 155 E. 44th St., New York, N. Y.
Eureka Button Co., 892 Broadway, New York, N. Y.
Eureka Mfg. Co., Taunton, Mass.
Eureka Paper Box Co., 401–435 E. Canal St., Williamsport 6, Pa.
Eureka Paper Box Corp., 4949 N. Pulaski, Rd., Chicago 30, Ill.
Eureka Specialty Printing Co., 530 Electric St., Scranton 9, Pa.
Evans-Winter-Hebb, Inc., 818 W. Hancock Ave., Detroit, Mich.
Ever Ready Label Corp., 141 E. 25th St., New York, N. Y.
Everett Transparent Container Co., 251 Third Ave., New York, N. Y.
Exact Weight Scale Co., The, 944 W. 5th Ave., Columbus 8, Ohio
Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit, Mich.
Excelsior Paper Specialty Co., Inc., 640 W. 57th St., New York, N. Y.
Export Fibreboard Case Assn., 155 Montgomery St., San Francisco, Calif.

F

Fabart Instrument Co., 4740 N. Clark St., Chicago, Ill.
Fabricated Products Co., 701 Washington Rd., Pittsburgh 16, Pa.
Fabricon Products of Conn., Inc., 587 Hollister Ave., Bridgeport, Conn.
Fairchild, E. E. Corp., 367 Orchard St., Rochester, N. Y.
Fales Chemical Co., Inc., The, Cornwall Landing, N. Y.
Farrel, Harry H., 6 N. Michigan Ave., Chicago, Ill.
Farrington Mfg. Co., 76 Atherton St., Boston 30, Mass.
Federal Carton Corp., 638 W. 57th St., New York, N. Y.
Federal Container Co., 56th St. & Paschall Ave., Phila., Pa.
Federal Paper Board Co., Inc., 24 River Rd., Bogota, N. J.
Federal Telephone & Radio Corp., 591 Broad St., Newark, N. J.
Federal Tin Co., Inc., 11 E. Barre St., Baltimore, Md.
Federal Tool Corp., 400 N. Leavitt St., Chicago 12, Ill.
Federico, Joseph B., 1205 Jefferson, New Baltimore, Mich.
Fein's Tin Can Co., Inc., 50th St. & 1st Ave., Bklyn, N. Y.
Fenton Label Co., 506–508 Race St., Phila. 6, Pa.
Ferguson, J. L. Co., Rt. 52 at Republic Ave., Joliet, Ill.
Ferguson-Lander Mfg. Co., 1733 W. Hubbard St., Chicago 22, Ill.
Fernstrom Paper Mills, Inc., 1450 Holt Ave., Pomona, Calif.
Ferrill, Harve & Co., 2635 S. Wabash Ave., Chicago 16, Ill.
Ferster, Reinhold Advertising, 110 Pearl St., Buffalo 2, N. Y.
Fibre Board Manufacturers Assn., 30 State St., Boston, Mass.
Fibreboard Products, Inc., 710 Russ Bldg., San Francisco 6, Calif.
Fibre Box Assn., 224 S. Michigan Ave., Chicago, Ill.
Fibre Cord Co., 755 E. 134th St., New York 54, N. Y.
Fibre Products Mfg. Co., 30 W. 13th St., New York 11, N. Y.
Fibro Container Corp., 510 First Ave., N., Minneapolis 3, Minn.
Fillmore & Slade, North Bennington, Vt.
Filtrol Corp., 634 S. Spring St., Los Angeles 14, Calif.
Findley, F. G. Co., The, 3053 W. Pemberton Ave., Milwaukee 10, Wis.
Firestone Rubber & Latex Products Co., 1 Firestone Ave., Fall River, Mass.
Fisher-Pierce Co., The, 70 Ceylon St., Boston, Mass.
Fitchburg Paper Co., Fitchburg, Mass.
Fitzhugh, William W. Inc., 424 Madison Ave., New York 17, N. Y.
Flannery Associates, Graybar Bldg., New York, N. Y.
Flashfold Box Corp., Ft. Wayne, Ind.
Fleischhacker Paper Box Co., 401 Second St., San Francisco, Calif.
Fleisig, H. Inc., 402 Lafayette St., New York, N. Y.
Fleming Potter Co., 1028 S. Adams St., Peoria 2, Ill.
Fleming & Sons, Inc., 1116 E. 12th St., Dallas, Texas
Flexible Packaging Inst., 369 Lexington Ave., New York, N. Y.
Flint, Howard Ink Co., Clark Ave. & M.C.R.R., Detroit 9, Mich.
Flood & Conklin Mfg. Co., 132 Chestnut St., Newark 5, N. J.
Floquil Products, Inc., 1993 Broadway, New York 23, N. Y.
Floramics Co., The, Tampa, Fla.
Flour City Paper Box Co., 510 Plymouth Ave., Minneapolis 11, Minn.
Flower City Specialty Co., 158 Hollenbeck St., Rochester, N. Y.
Flower City Tissue Mills Co., 700 Driving Park Ave., Rochester, N. Y.
Folding Boxes, Inc., Manchester, Conn.
Folding Paper Box Assn. of America, 134 N. La Salle St., Chicago, Ill.
Folding Paper Box Mfrs. Assn., 521 Fifth Ave., New York, N. Y.
Fontaine Products Corp., 306 E. 61st St., New York 21, N. Y.
Food Dispenser Co., The, 117 Spruce St., Hartford, Conn.
Food Machinery Corp., Hoopeston, Ill.
Forbes Lithograph Mfg. Co., P. O. Box 513, Boston 2, Mass.
Force, William A. & Co., Inc., 216 Nichols Ave., Bklyn 8, N. Y.
Fort Howard Paper Co., Green Bay, Wis.
Fort Orange Paper Co., Castleton-on-Hudson, N. Y.
Fort Wayne Corrugated Paper Co., Ft. Wayne 1, Ind.
Foster & Cross, 105 Lexington Ave., Bklyn, N. Y.
Foster-Grant Co., Inc., 289 N. Main St., Leominster, Mass.
Fox, C. J. Co., The, 236 Aborn St., Providence 1, R. I.
Foxboro Co., The, Foxboro, Mass.
Foxon Co., The, 235 W. Park St., Providence, R. I.
Frankenberg Bros., Inc., 479 S. Ludlow St., Columbus 15, Ohio
Franklin Board & Paper Co., The, Franklin, Ohio
Franklin Folding Paper Box Co., 233 W. Huron St., Chicago, Ill.
Franklin Plastics Div., Robinson Industries, Inc., 335 Grant St., Franklin, Pa.
Franklyn Folding Box Co., 769 Chauncey St., Bklyn 7, N. Y.
Frann Paper Co., 861–867 E. 29th St., Bklyn, N. Y.
Freedman Die Cutters, Inc., 12 W. 20th St., New York 11, N. Y.
Freeman, Edna Leslie, 37 Madison Ave., Rm. 1106, New York, N. Y.
Freeman, Nathaniel H., 6 E. 45th St., New York 17, N. Y.
Freight Claim Div., Assn. of American Railroads, 59 E. Van Buren St., Chicago, Ill.

XUM

French-Bray Printing Co., 109 Market Pl., Baltimore 2, Md.
Freydberg Bros.-Strauss, Inc., 212 Fifth Ave., New York 10, N. Y.
Friedman Art, 1151 Broadway, New York, N. Y.
Friedman Bag Co., 600 Aliso St., Los Angeles 54, Calif.
Friend Box Co., 90 High St., Danvers, Mass.
Frohn, John C., 10 Thatcher St., Boston, Mass.
Frost Box Co., Inc., Pawtucket, R. I.
Frost White Paper Mills, Inc., 303 Fifth Ave., New York, N. Y.
Frosted Foods Institute of Calif., 420 Market St., San Francisco, Calif.
Fuchs & Lang Div., Sun Chemical Corp., 100 6th Ave., New York 13, N. Y.
Fulton Bag & Cotton Mills, Atlanta, Ga.
Futuristic Paper Box Co., Inc., 346 Carroll St., Bklyn, N. Y.

G

Gaetjens, Berger & Wirth, Inc., 35 York St., Bklyn. 1, N. Y.
Gair, Robert Co., Inc., 155 E. 44th St., New York 17, N. Y.
Gala Giftwraps & Specialties, Inc., 233 Spring St., New York 13, N. Y.
Gallie-King Bag Co., P. O. Box 1191, Houston, Texas
Gamse Lithographing Co., Inc., 419 E. Lombard St., Baltimore 2, Md.
Gardner-Richardson Co., The, 407 Charles St., Middletown, Ohio
Garfield Box Co., 2 Ackerman Ave., Clifton, N. J.
Garfield Mfg. Co., 10 Midland Ave., Garfield, N. J.
Garvey Fountain Brush & Ink Co., Newstad & Clayton Aves., St. Louis, Mo.
Gates Paper Co., Ltd., 5955 S. Western Ave., Los Angeles 44, Calif.
Gaylord Container Corp., 111 N. 4th St., St. Louis 2, Mo.
Gaynor Glass Works, Salem, N. J.
Gebhart Folding Box Co., The, 22 Powers St., Dayton, Ohio
Gellman Mfg. Co., 1700 First St., Rock Island, Ill.
Gemloid Corp., 79-10 Albion Ave., Elmhurst, L. I., N. Y.
General Bag Corp., 2715 E. 34th St., Cleveland, Ohio
General Can Co., 1603 S. Canal St., Chicago, Ill.
General Cellulose Co., Inc., The, 1939 South Ave., Garwood, N. J.
General Electric Co., Chemical Dept. Plastics Divs., 1 Plastics Ave., Pittsfield, Mass.
General Electric Co., 1 River Road, Schenectady 5, N. Y.
General Felt Products, Div., Standard Cap & Seal Corp., 68 35th St., Bklyn 32, N. Y.
General Industrial Finishes Div., Sun Chemical Corp., 100 6th Ave., New York 13, N. Y.
General Industries Co., Elyria, Ohio
General Insulate Co., Inc., 11 New York Ave., Bklyn, N. Y.
General Laminating, Inc., 60 Park Pl., Newark, N. J.
General Molded Products, Inc., 1300 Oakwood Ave., Des Plaines, Ill.
General Molding Co., Robbins & Rockledge Aves., Rockledge, Pa.
General Printed String Co., 1736 N. Second St., Milwaukee 12, Wis.
General Printing Ink Co., Div. Sun Chemical Corp., 100 6th Ave., New York 13, N. Y.
General Products Corp., 107 Salem St., Union Springs, N. Y.
General Ribbon Mills, Catasauqua, Pa.
Genesee Finishing Corp., 163 St. Paul St., Rochester, N. Y.
Genesee Valley Lithograph Co., Inc., 425 Exchange St., Rochester, N. Y.
Genesee Valley Paper Co., Inc., 360 East Ave., Rochester, N. Y.
George, P. D. Co., The, 5200 N. 2nd St., St. Louis 7, Mo.
George & Sherrard Paper Co., 220 E. 42nd St., New York 17, N. Y.
Gerbereux, Dufft & Kinder, 80 Richard St., Bklyn, N. Y.
Gereke-Allen Carton Co., 5101 Penrose St., St. Louis, Mo.
Gerrard Steel Strapping Co., 2915 W. 47th St., Chicago 32, Ill.
Germain's, 739 Terminal St., Los Angeles, Calif.
Gerth, Ruth, 228 E. 61st St., New York 21, N. Y.
Gesell, R. Inc., 200 W. Houston St., New York, N. Y.
Gesler Jewelry Co., 106 Gesler St., Providence, R. I.
Gianninoto, Frank & Associates, 250 Park Ave., New York, N. Y.
Gibbs Mfg., 2411 6th St., Berkeley, Calif.
Gibson-Jones Co., Inc., 400 Madison Ave., New York, N. Y.
Gindick, Franklin, 606 S. Hill St., Los Angeles 14, Calif.
Gits Molding Corp., 4600 W. Huron St., Chicago, Ill.
Glass Container & Cap Outlet Co., 876 Broadway, New York, N. Y.
Glass Container Mfrs. Inst., 250 Park Ave., New York, N. Y.
Glass Containers, Inc., 3601 Santa Fe Ave., Los Angeles 11, Calif.
Glass Industries, Inc., 10 W. 33rd St., New York 1, N. Y.
Glassine & Greaseproof Paper Mfrs. Assn., 122 E. 42nd St., New York, N. Y.
Glassine Paper Co., The, W. Conshohocken, Pa.
Glickman, L. & Co., 505 Johnson Ave., Bklyn, N. Y.
Glidden Co., Berea & Madison Sts., Cleveland, Ohio
Globe Imperial Corp., Rockford, Ill.
Globe Mfg. Co., 2009 Kinsey St., Phila. 24, Pa.
Globe Paper Box Co., 233 W. Huron St., Chicago 10, Ill.
Globe Paper Box Mfg. Co., 1227 University Ave., St. Paul, Minn.
Glue-Fast Equipment Co., Inc., 30 W. 15th St., New York, 11, N. Y.
Glyco Products Co., Inc., 26 Court St., Bklyn 2, N. Y.
Goat, Fred Co., Inc., The, 314 Dean St., Bklyn, N. Y.
Golden Gate Mfg. Co., 1250 Powell, Oakland, Calif.
Goldsborough, Francis F., 355 5th Ave., New York, N. Y.
Goodrich, B. F. Chemical Co., 324 Rose Bldg., Cleveland 15, Ohio
Goodyear Tire & Rubber Co., E. Market St., Akron, Ohio
Gordon Cartons, Inc., 1629 Warner St., Baltimore 1, Md.
Gordon-Lacey Chemical Products Co., Inc., 57-02 48th St., Maspeth, L. I., N. Y.
Gorham Co., The, Elmwood P. O., Providence, R. I.
Goss Printing Press Co., 1535 S. Paulina Ave., Chicago, Ill.
Gotham Tissue Corp., 1000 E. 149th St., New York, N. Y.
Gottschalk Design, 6557 University Drive, University City, Mo.
Gottscho, Adolph Inc., 190 Duane St., New York 13, N. Y.
Grace, Tom W. Co., 1504 Munger Ave., Dallas, Texas
Grady & Neary Co., 117 W. Harrison St., Chicago, Ill.
Graffin Bag Co., Inc., 1407 Philpot St., Baltimore 31, Md.
Graham Mfg. Co., Holyoke, Mass.
Grammes, L. F. & Sons, Inc., 363 Union St., Allentown, Pa.
Grand-City Container Corp., 622 W. 57th St., New York, N. Y.
Grand Rapids Label Co., Graphic Arts Bldg., 545 Ottawa Ave., N. W., Grand Rapids 2, Mich.
Grand Rapids Paper Box Co., 231 Fulton St., W., Grand Rapids 2, Mich.
Grand Sheet Metal Works, 2501 W. 24th St., Chicago, Ill.
Grant Paper Box Co., 3000 Liberty Ave., Pittsburgh 1, Pa.
Grau, Russell, 603 Standard Bldg., Atlanta, Ga.
Gray Wire Specialty Co., 1761 E. 39th St., Cleveland, Ohio
Great American Plastics Co., 55 North St., Fitchburg, Mass.
Great Lakes Box Co., The, 7275 Wentworth Ave., Cleveland, Ohio
Green Bros., Inc., 35 Valley St., E. Providence, R. I.
Greene's Ceramic Products Co., Inc., 17th St. & California Ave., Sebring, Ohio
Greene, Frederick E., P. O. Box 2, Weston Rd., Westport, Conn.
Greenfield Paper Box Co., 57 Pierce St., Greenfield, Mass.
Gregg, C. L., 209 W. 38th St., New York, N. Y.
Gregory Motors, Inc., 59 E. 34th St., New York, N. Y.
Griffin, Campbell, Hayes, Wash, Inc., 50 E. 21st St., New York, N. Y.
Grigoleit Co., The, 740 E. North St., Decatur, Ill.
Grimes Co., The, 1333 11th St., Denver 1, Colo.
Grimes Mfg. Co., Urbana, Ohio
Grimley, Frank J., 255 Shipley St., San Francisco, Calif.
Grotelite Co., Inc., The, Lafayette & Grandview Aves., Belleview, Ky.
Grover, Frederick S., 154 East Ave., Rochester 4, N. Y.
Gruen, Robert Associates, 509 Madison Ave., New York 22, N. Y.
Guardian Safety Seal Co., 35 E. Wacker Dr., Chicago 1, Ill.
Guilford Folding Box Co., The, Haven St. & Ashland Ave., Baltimore, Md.
Guilliksen, W. M. Mfg. Co., Newton Lower Falls, Mass.
Gummed Industries Assn., 19 W. 44th St., New York, N. Y.
Gummed Products Co., The, Troy, Ohio
Gummed Tape & Devices Co., 1318–1320 60th St., Bklyn 19, N. Y.
Gump, B. F. Co., 445–450 S. Clinton St., Chicago 7, Ill.
Gutmann, Ferdinand & Co., 3615 14th Ave., Bklyn 18, N. Y.
Gutterson & Co., Inc., 420 Lexington Ave., New York, N. Y.

H

Haas Corp., The, Mendon, Mich.
Hagopian, Vahan, 40 E. 49th St., New York 17, N. Y.
Haida Engineering Co., 34-11 Vernon Blvd., Long Island City 1, N. Y.
Hall, Frances Cushing, Wilton, Conn.
Halsted, E. S. & Co., Inc., 64 Pearl St., New York, N. Y.
Hamersley Mfg. Co., The, 65 River Drive, Garfield, N. J.
Hamilton, J. T. & A., Co., 26th & A.V.R.R., Pittsburgh, Pa.
Hamill, Virginia, 415 Lexington Ave., New York, N. Y.
Hampden Glazed Paper & Card Co., Inc., Water St., Holyoke, Mass.
Hampshire Paper Box Co., Nonotuck St., Florence, Mass.
Hankins Container Co., 3044 W. 106th St., Cleveland, Ohio
Hardin Bag & Burlap Co., Inc., The, 1054 Constance, New Orleans, La.
Harlich Mfg. Co. 1417 W. Jackson Blvd., Chicago 7, Ill.
Harris-Seybold Co., 4510 E. 71st St., Cleveland, Ohio
Hart Moisture Gauges, Inc., 126 Liberty St., New York 6 N. Y.
Hartford City Paper Co., 15 Park Row, New York, N. Y.
Harvard Specialty Mfg. Corp., 99 Broadway, Cambridge Mass.
Harvey, Grace, 18 W. 69th St., New York 23, N. Y.
Harvey Paper Products, Sturgis, Mich.
Hashagen Paper Box Co., 228 First St., N. W., Washington, D. C.
Hawley Pulp & Paper Co., Oregonian Building, Portland, Ore.
Hayden, E. J. & Co., Inc., 118 E. 25th St., New York, N. Y.
Haynes Lithograph Co., Silver Spring, Ind.
Hayssen Mfg. Co., 13th St. & St. Clair Ave., Sheboygan, Wis.
Hazel-Atlas Glass Co., 15th & Jacob Sts., Wheeling, W. Va.
Hazen Paper Co., 208 Race St., Holyoke, Mass.
Heaphy, Charles F. Co., 420 Lexington Ave., New York, N. Y.
Heat Seal-It Co., 4316 Lancaster Ave., Phila. 4, Pa.
Heekin Can Co., The, Cincinnati 2, Ohio
Heidt Glass Works, Inc., 1609 DeKalb Ave., Bklyn 27, N. Y.
Heil Engineering Co., 12901 Elmwood Ave., Cleveland, Ohio
Heinrich, H. H. Inc., 200 Varick St., New York 14, N. Y.
Heller Co., The, 2135 Superior Ave., Cleveland 14, Ohio
Hellmuth, Charles Printing Ink Corp., 154 W. 18th St., New York, N. Y.
Helmco, Inc., 1215 W. Fullerton Ave., Chicago, Ill.
Helmold, J. F. & Bro., 1462 Shakespeare Ave., Chicago, Ill.
Heminway Corp., 155 S. Leonard St., Waterbury, Conn.
Henle Wax Paper Mfg. Co., Inc., 1428 Longfellow Ave., New York 59, N. Y.
Henlopen Mfg. Co., Lewes, Del.
Henry, Ira L. Co., Elm & Union Sts., Watertown, Wis.
Henschel, C. B. Mfg. Co., 229 W. Mineral St., Milwaukee, Wis.
Heppe-Hudson Co., 191–193 Washington St., Jersey City, N. J.
Hercules Powder Co., Wilmington, Del.
Heresite & Chemical Co., 822 S. 14th St., Manitowoc, Wis.
Herz, Alexander Co., Inc., 840 E. 134th St., New York 54, N. Y.
Hess & Barker, 212–22 S. Darien St., Phila. 7, Pa.
Hess & Densen, Inc., 129 W. 20 St., New York 11, N. Y.
Hewitt, C. B. & Bros., Inc., 18 Greene St., New York, N. Y.
Heywood Mfg. Co., 420 N. 3rd St., Minneapolis, Minn.
Hickory Paper Box Co., 341 10th Ave., Hickory, N. C.
High Point Paper Box Co., Inc., 319 Mangum Ave., High Point, N. C.
Hi-Land Paper Products Co., Ossining, N. Y.
Hill-Hentschel Co., 3928 Clayton Ave., St. Louis 10, Mo.
Hilton-Davis Co., Langdon Rd. & Penn. R.R., Cincinnati, Ohio
Hinde & Dauch Paper Co., The, 4339 Decatur St., Sandusky, Ohio
Hinkson Paper Co., Pinney St., Palmer, Mass.
Hoague-Sprague Corp., 130 Eastern Ave., Lynn, Mass.
Hoberg Paper Mills, Green Bay, Wis.
Hodges, Guy W. Inc., 331 Madison Ave., New York 17, N. Y.
Hodgman Rubber Co., Framingham, Mass.
Hoe, R. & Co., Inc., East River & 138th St., New York, N. Y.
Holed-Tite Packing Corp., Herkimer, N. Y.
Holes, Floyd A. Co., 100 Northfield Rd., Bedford, Ohio
Hollingsworth & Whitney Co., 60 Batterymarch St., Boston, Mass.
Hollinston Mills, Inc., The, Lenox St., Norwood, Mass.
Hollis, Morton, 69–85 Canal St., Boston, Mass.
Hollywood Paper Box Div., The Flintkote Co., 1041 N. La Brea Ave., Hollywood, Calif.
Holyoke Card and Paper Co., 95 Fisk Ave., Springfield, Mass.
Hooper, F. X. Co., Glenarm, Md.
Hope Paper Box Co., 10 Beach St., Providence, R. I.
Horix Mfg. Co., Corliss Station, Pittsburgh 4, Pa.
Horne, E. C. Machinery Co., 315 E. & C. Bldg., Denver 2, Colo.
Horung, Clarence P., 23 W. 47th St., New York, N. Y.
Houghton, E. F. Co., 303 W. Lehigh Ave., Phila., Pa.
House of Price, 137 Hudson St., New York, N. Y.
Howe Scale Co., The, Rutland, Vt.
Howell, F. M. & Co., 79–95 Penn Ave., Elmira, N. Y.

Hubbs, Charles F. & Co., 389 Lafayette St., New York, N. Y.
Huber, J. M. Inc., 460 W. 34th St., New York, N. Y.
Hudson, H. L. Co., The, 56 Pearl St., Bklyn, N. Y.
Hudson Pulp & Paper Corp., 220 E. 42nd St., New York, N. Y.
Hudson-Sharp Machine Co., 1207 Main St., Green Bay, Wis.
Hughes & Hoffman, 217–219 Mercer St., New York, N. Y.
Hulbert Engineering Corp., 903 Clyman St., Watertown, Wis.
Hull, A. E. Pottery Co., The, Crooksville, Ohio
Humans, Maria, 6 E. 45th St., New York, N. Y.
Humitube Mfg. Co., 233 N. Madison Ave., Peoria 3, Ill.
Hummel & Downing Co., Milwaukee, Wis.
Hummel-Ross Fibre Corp., Hopewell, Va.
Hussey-Woodward, Inc., 79 W. 45th St., New York 19, N. Y.
Hutchinson Bag Co., The, C & Poplar Sts., Hutchinson, Kan.
Hychex Products, 3935 West Irving Park Rd., Chicago 18, Ill.
Hyde, A. L. Co., Main St., Grenloch, N. J.
Hygienol Co., Inc., 120 W. 42nd St., New York, N. Y.

I

Ideal Carton Co., 1652 Besly Court, Chicago, Ill.
Ideal Novelty & Toy Co., 23-10 43rd Ave., Long Island City, N. Y.
Ideal Stencil Machine Co., 101 Iowa St., Belleville, Ill.
Illini Molded Plastics, 528 West Chestnut St., Hinsdale, Ill.
Illinois Paper Box Co., 1801 N. Wolcott Ave., Chicago, Ill.
Imperial Box Co., 1566 Carroll Ave., Chicago, Ill.
Imperial Lithographing Co., 902 E. Hamilton St., Milwaukee, Wis.
Imperial Molded Products Corp., 2925 W. Harrison St., Chicago, Ill.
Imperial Paper Box Corp., 252 Newport St., Bklyn 12, N. Y.
Independent Can Co., 1301 S. Howard St., Baltimore, Md.
Independent Lithograph Co., 298 Alabama, San Francisco 3, Calif.
Indianapolis Paper Container Corp., 217 W. 10th St., Indianapolis 2, Ind.
Industrial Lithographic Co., 285 Madison Ave., New York, N. Y.
Industrial Molded Products Co., Inc., 2035 Charleston St., Chicago 47, Ill.
Industrial Packaging Co., 1155 Manhattan Ave., Bklyn 22, N. Y.
Industrial Packaging Engineers Assn. of America, 134 S. La Salle St., Chicago, Ill.
Industrial Shredder & Cutter Co., 707 S. Allsworth Ave., Salem, Ohio
Industrial Tape Corp., New Brunswick, N. J.
Ingwersen Mfg. Co., 1810–1820 S. Acoma St., Denver, Colo.
Injection Molding Co., 3827 Independence Ave., Kansas City, Mo.
Injection Molding Corp., 115 Fourth Ave., New York, N. Y.
Inland Container Corp., 700 W. Morris St., Indianapolis 6, Ind.
Inland Lithograph Co., 328 S. Jefferson St., Chicago 6, Ill.
Inland Mfg. Div., General Motors Corp., 2727 Inland Ave., Dayton, Ohio
Inland Steel Container Co., 6532 S. Menrad Ave., Chicago 38, Ill.
Inman Mfg. Co., Inc., 41–53 Guy Park Ave., Amsterdam, N. Y.
Insel Co., Schuyler Ave., Foot of Quincy Ave., Arlington, N. J.
Institute of Food Technologists, N. Y. Agricultural Experimental Station, Geneva, N. Y.
Institute of Paper Chemistry, Appleton, Wis.
Insulation Mfg. Co., Inc., 11 New York Ave., Bklyn, N. Y.
Insulation Products Co., 504 N. Richland St., Pittsburgh 8, Pa.
In-Tag, Div. of Interchemical Corp., 75 Varick St., New York, N. Y.
Interchemical Corp., 350 Fifth Ave., New York, N. Y.
Interlake Chemical Corp., 1900 Union Commerce Bldg., Cleveland 14, Ohio
International Folding Paper Box Co., 2029 83 St., N. Bergen, N. J.
International Mailing Tube & Wrapper Co., 29-05 Review Ave., Long Island City, N. Y.
International Molded Plastics, Inc., 43–83 W. 35th St., Cleveland, Ohio
International Paper Box Machine Co., 315 Main St., Nashua, N. H.
International Paper Co., 220 E. 42nd St., New York, N. Y.
International Paper Products Div. of International Paper Co., 220 E. 42nd St., New York, N. Y.
International Plastic Corp., 10 Park Place, Morristown, N. J.
International Printing Ink and Finishes, Divs. of Interchemical Corp., 350 Fifth Ave., New York 1, N. Y.
International Staple & Machine Co., Penn St., Clifton Heights, Pa.
Interstate Bag Co., Walden, N. Y.
Interstate Folding Box Co., The, Verity Parkway, Middletown, Ohio
Irvington Varnish & Insulator Co., 6 Argyle Terrace, Irvington, N. J.
Irwin Corp., 27 W. 20th St., New York, N. Y.
Island Equipment Corp., 101 Park Ave., New York 17, N. Y.
Ivers-Lee Co., 215 Central Ave., Newark 4, N. J.

J

J. L. Paper Box Co., North Attleboro, Mass.
J & L Steel Barrel Co., Pittsburgh, Pa.
Jackson, McStay Co., 840 N. Michigan Ave., Chicago, Ill.
Jamieson, C. E. & Co., 1962 Trombly, Detroit, Mich.
Jamison, H., 71 E. Sunrise Highway, Freeport, L. I., N. Y.
Jarrell, B. C. & Co., Humboldt, Tenn.
Jay Advertising Co., Lincoln Highway, W. Lancaster, Pa.
Jay, Norbert, 350 Fifth Ave., New York 1, N. Y.
Jaypaco Co., 405 E. 4th St., New York, N. Y.
Jeffrey Mfg. Co., The, 828–99 N. 4th St., Columbus 16, Ohio
Jensen, Gustav, 16 E. 48th St., New York, N. Y.
Jiffy Mfg. Co., 360 Florence Ave., Hillside, N. J.
Johnson, A. Machine Works, 251–259 Lee Ave., Bklyn 6, N. Y.
Johnson, Charles Ebey & Co., 10th St. at Lombard, Phila., Pa.
Johnston Paper Co., The, 2060 Reading Road, Cincinnati, Ohio
Johnston Tin Foil & Metal Co., The, 6106 S. Broadway, St. Louis 11, Mo.
Joliet Chemicals, Ltd., Industry Ave., Joliet, Ill.
Jolly Gulp, Inc., 4351–9 W. Rosevelt Rd., Chicago, Ill.
Jones E. Willis, 333 N. Michigan Ave., Chicago, Ill.
Jones Dabney Co., Louisville, Ky.
Jones, Jesse Paper Box Co., 1025 Vine St., Phila., Pa.
Jones & Laughlin Steel Corp., 311 Ross St., Pittsburgh 30, Pa.
Jones, R. A. & Co., Inc., P. O. Box 485, Cincinnati, Ohio

K

K. C. Plastic Fabricators, 1529 Cherry St., Kansas City, Mo.
Kalamazoo Paper Box Co., 389 S. Pitcher St., Kalamazoo 99, Mich.
Kalamazoo Vegetable Parchment Co., Parchment, Kalamazoo 99, Mich.
Kampa Mfg. Co., 12132 W. Capitol Drive, Milwaukee, Wis.
Kaplan Products & Textiles, Inc., 460 Fourth Ave., New York 17, N. Y.
Karasz, Ilonka, Gage Hill, Brewster, N. Y.
Kaumagraph Co., 14th & Poplar Sts., Wilmington, Del.
Kay Inc., 9 E. 40th St., New York 16, N. Y.
Kayton, Robert Displays Inc., 127 W. 26th St., New York, N. Y.
Keasbey & Mattison, Butler Pike, Ambler, Pa.
Keeler Brass Co., 955 Gottfried Ave., S. W., Grand Rapids, Mich.
Kehr Paper Products Co., 401 N. Broad St., Phila., Pa.
Keith-Peabody, Inc., 1038 Beacon St., Brookline, Mass.
Keller-Dorian Corp., 350 Fifth Ave., New York 1, N. Y.
Kellogg Switchboard & Supply Co., 6650 S. Cicero Ave., Chicago, Ill.
Kelly, E. J. Co., Subsidiary, Sun Chemical Corp., 1807 N. Pitcher St., Kalamazoo 45, Mich.
Kennedy Car Liner & Bag Co., Inc., Prospect St., Shelbyville, Ind.
Kent, Percy Bag Co., Inc., 320 Broadway, New York, N. Y.
Kentucky Paper Box Co., 117 N. 6th St., Louisville, Ky.
Keolyn Plastics Co., 2731 N. Pulaski Rd., Chicago, Ill.
Ketcham, Howard, Inc., 101 Park Ave., New York 17, N. Y.
Ketterlinus Lithographic Mfg. Co., 4 & Arch Sts., Phila., Pa.
Keyes Fibre Co., Upper College Ave., Waterville, Me.
Keystone Bag & Burlap Co., 854 N. Prince St., Lancaster, Pa.
Keystone Box Co., 28th & Smallman Sts., Pittsburgh, Pa.
Keystone Cap Co., 10th & Blunston Sts., Columbia, Pa.
Keystone Drum Co., Div., Continental Can Co., Inc., Pittsburgh, Pa.
Keystone Specialty Co., 1373 ½ Cove Ave., Lakewood, Cleveland, Ohio
Kidder Press Co., Inc., Dover, N. H.
Kieckhefer Container Co., 130 N. Broadway, Camden, N. J.
Kiefer, Karl Machine Co., 919 Martin St., Cincinnati 2, Ohio
Kiernan-Hughes Co., Ninth & Brunswick Sts., Jersey City, N. J.
Kilgore Mfg. Co., The, Plastics Div., 200 E. Broadway, Westerville, Ohio
Kimberly-Clark Corp., Neenah, Wis.
Kimble Glass Co., Vineland, N. J.
Kindred, MacLean & Co., Inc., 43-01 22nd St., Long Island City 1, N. Y.
King Bag Co., 125 E. Front St., Cincinnati, Ohio
King Mfg. Co., 22 Main St., Cincinnati, Ohio
King Plastic Corp., Speer Blvd. & Lincoln St., Denver, Colo.
Kingman, E. B. Co., 96 Exchange St., Leominster, Mass.
Kirby-Cogeshall-Steinau Co., 606 E. Clybourne St., Milwaukee, Wis.
Kirk, F. J. Molding Co., 140 Brook St., Clinton, Mass.
Klein, A. & Co., Inc., 113 W. 17th St., New York, N. Y.
Kline, Leon M., 130 W. Maple St., York, Pa.
Kling Bros. Eng. Works, 1320 N. Kostner Ave., Chicago, Ill.
Knoche, Lucille, 664 N. Michigan Ave., Chicago, Ill.
Knoedler, A. Co., 651 High St., Lancaster, Pa.
Knowlton, M. D. Co., 28 Industrial St., Rochester, N. Y.
Koch, Carl Peter, 35 E. Wacker Drive, Chicago, Ill.
Koehl, William Co., The, 1020 Hulbert Ave., Cincinnati 14, Ohio
Kogan, Belle, 362—5th Ave., New York, N. Y.
Kohl & Madden Printing Ink Co., 713 Plymouth Court, Chicago, Ill.
Kono-Mead, 133-23 35th Ave., Flushing, L. I., N. Y.
Koodin-Lapow Associates, 250 W. 57th St., New York 19, N. Y.
Koppel, E. Leonard, 40 E. 49th St., New York 17, N. Y.
Koster, Louis H., 143 E. 40th St., New York, N. Y.
Kraber, G. R., 516 Watertown St., Newtonville, Mass.
Kraft Bag Corp., 630 5th Ave., New York, N. Y.
Kraft Paper Assn., 122 E. 42nd St., New York 17, N. Y.
Krause, Richard M. Inc., 45 E. 19th St., New York 3, N. Y.
Krengel Mfg. Co., 227 Fulton St., New York, N. Y.
Kress, F. J. Box Co., 1—28th St., Pittsburgh 22, Pa.
Kroeck Paper Box Co., 1701 W. Superior St., Chicago 22, Ill.
Kropp, Willis Ahlborn, 346 Gale Ave., River Forest, Ill.
Kuhn & Jacob Moulding & Tool Co., 1200 Southard St., Trenton 8, N. J.
Kupfer Bros. Co., 2 Astor Place, New York 3, N. Y.
Kurz-Kasch, Inc., 1421 S. Broadway, Dayton, Ohio

L

L-A Paper Box Factory, 2615 E. 12th St., Los Angeles, Calif.
Label Mfrs. National Assn., 1700 Eye St., N. W., Washington, D. C.
LaBoiteaux Co., Inc., The, 2985 Madison Rd., Cincinnati, Ohio
Lakone Co., 500 Rathbone Ave., Aurora, Ill.
Lakso Co., The, P. O. Box 257, Fitchburg, Mass.
Lambooy Label & Wrapper Co., 2129 Portage St., Kalamazoo 29 F, Mich.
Laminating Corp., 1313 W. Randolph St., Chicago, Ill.
Laminoid, Inc., 2125 83rd St., N. Bergen, N. J.
Lamson Corp., 1003 Lamson St., Syracuse 1, N. Y.
Landowne, J. Co., The, 561 Grand Ave., Bklyn, N. Y.
Lane, Jack, 49 W. 45th St., New York, N. Y.
Lanfare Molded Products, 1519 Freeman St., Toledo, Ohio
Langston, Samuel M. Co., 1930 S. 6th St., Camden, N. J.
Lansky Die Cutting Co., 192½ Greene St., New York 12, N. Y.
Lapin Products, Inc., 164 Delancy St., Newark 5, N. J.
Latimar, E. Jr. & Co., 126 N. 4th St., Phila. 5, Pa.
Laucks Laboratories, Inc., 911 Western Ave., Seattle, Wash.
Lauxite Corp., 116 S. Niagara St., Lockport, N. Y.
LaWall & Harrisson, 1921 Walnut St., Phila. 3, Pa.
Lawless Bros. Paper Mills, Inc., E. Rochester, N. Y.
Lawson, Jacob Bag Co., 264 Water St., New York, N. Y.
Lead Industries Assn., 420 Lexington Ave., New York, N. Y.
Lea-Tek Studio, 619 N. Michigan Ave., Chicago, Ill.
Lebanon Paper Box Co., Lebanon, Pa.
LeComte & Co., Inc., 147 41st St., Bklyn, N. Y.
Leeds Sales Co., Inc., 34 W. 34th St., New York 1, N. Y.
Lehmann Printing & Lithographing Co., 400 4th St., San Francisco 7, Calif.
Leigh Banana Case Co., Ellentown, S. C.
Lengsfield Bros., Inc., 1101 Tchoupitoulas St., New Orleans 6, La.
Lenoir Pad & Paper Co., Lenoir, N. C.
Leominster Paper Box Co., 43 Granite St., Leominster, Mass.
LePage's, Inc., 144 Essex Ave., Gloucester, Mass.
Lev-A-Lift Co., The, 277 Broadway, New York 7, N. Y.
Levey, Frederick H. Co., Inc., 41 E. 42nd St., New York, N. Y.
Levey, H. A. Laboratories, Oleander & Dublin Sts., New Orleans 18, La.
Levitan Mfg. Co., 236 Greenpoint Ave., Bklyn, N. Y.
Lewellen Mfg. Co., Columbus, Ind.
Lewis, Ben, 16 E. 52nd St., New York 22, N. Y.
Lewis-Shepard, 117 Walnut St., Watertown, Mass.
Libby Glass Mfg. Co., 100 Ash St., Toledo, Ohio
Liberty Can & Sign Co., 303 N. Plum St., Lancaster, Pa.

XUM

Liberty Glass Co., Sapulpa, Okla.
Liberty Paperboard Co., The, Steubenville, Ohio
Lily-Tulip Cup Corp., 122 E. 42nd St., New York 17, N. Y.
Lincoln Can Mfg. Corp., 4012 2nd Ave., Bklyn, New York
Lindenhurst Mfg. Co., Inc. 175 S. Smith St., Lindenhurst, N. Y.
Lindley Box & Paper Co., 1747 W. 2nd St., Marion, Ind.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Lippincott, J. Gordon & Co., 500 Fifth Ave., New York 18, N. Y.
Liquid Carbonic Corp., The, 3100 S. Kedzie Ave., Chicago 23, Ill.
Liquid Tight Paper Container Assn., 1532 Lincoln-Liberty Bldg., Phila., Pa.
Litho Can Corp., 16th & Mickle Sts., Camden, N. J.
Lithographers Finishing Co., Inc., 224 Centre St., New York, N. Y.
Lithographers National Assn., Inc., 420 Lexington Ave., New York, N. Y.
Lithographic Technical Foundation, 1800 S. Prarie Ave., Chicago 16, Ill.
Little, Arthur D. Inc., 30 Charles River Rd., Cambridge, Mass.
Little Falls Paper Co., Inc., The, Walsh Ave., Newburgh, N. Y.
Livingston & Co., Inc., 468 W. Broadway, New York, N. Y.
Loewy, Raymond, Associates, 580—5th Ave., New York, N. Y.
Logan Co., 1115 Franklin St., Louisville 6, Ky.
Lone Star Bag & Bagging Co., Houston, Texas
Lord Baltimore Press, The, 1500 Greenmount Ave., Baltimore 2, Md.
Loroco Industries, Inc., 100 E. Benson St., Reading 15, Ohio
Lorscheider-Schang Co., Inc., The, 140 N. Fitzhugh St., Rochester, N. Y.
Los Angeles Testing Laboratory, 1300 S. Los Angeles St., Los Angeles, Calif.
Lowe, E. S. Co., 27 W. 20th St., New York 11, N. Y.
Lowe Paper Co., River St., Ridgefield, N. J.
Lowery & Schwartz, Inc., 20 Van Dam St., New York, N. Y.
Lowman Folding Box Corp., 156 Solar St., Syracuse, N. Y.
Lucas, Mildred C., 369 Lexington Ave., New York, N. Y.
Lusteroid Container Co., Inc., South Orange, N. J.
Lutz & Sheinkman, 421 Hudson St., New York, N. Y.
Lux, Eugene J., 323 E. 58th St., New York, N. Y.
Lynch Package Machinery Corp., 3600 N. Summit St., Toledo 1, Ohio

M

M & R Mfg. Co., 48 Blanche St., Mansfield, Ohio
M. R. M. Co., 223 E. 106th St., New York 29, N. Y.
Mass & Waldstein Co., 438 Riverside Ave., Newark, N. J.
Mac Andrews & Forbes Co., 3rd & Jefferson Sts., Camden, N. J.
Mack Molding Co., 132 Main St., Wayne, N. J.
Macnair, C. S. & Associates, 228 N. La Salle St., Chicago 1, Ill.
Mac Sim Bar Paper Co., Otsego, Mich.
Maderite Paper Box Co., 95 Main St., Winsted, Conn.
Maffitt, Howard C., 522 11th St., Des Moines, Iowa
Magill-Weinsheimer Co., 1320–1334 S. Wabash Ave., Chicago 5, Ill.
Maine Potato Bag Co., Caribou, Maine
Majestic Metal Specialty, Inc., 576 5th Ave., New York, N. Y.
Makalot Corp., 262 Washington St., Boston 9, Mass.
Makdon Co., 306 W. 37th St., New York, N. Y.
Makowsky, J. Corp., 438 W. 37th St., New York, N. Y.
Manchester Board & Paper Co., Inc., Canal St. Nr. Hull, Richmond 24, Va.
Manders Co., Inc., The, 31 W. 27th St., New York, N. Y.
Manhattan Paste & Glue Co., Inc., 425 Greenpoint Ave., Bklyn 22, N. Y.
Mankato Paper Co., 726–728 S. Front St., Mankato, Minn.
Manufacturers Can Co., 3848 W. Lake St., Chicago, Ill.
Manufacturers Packaging Co., 27 Richmond St., Newark 3, N. J.
Manufacturers Printing Ink Corp., 1 Main St., Bklyn, N. Y.
Marathon Corp., Menasha, Wis.
Marblette Corp., The, 3721 30th St., Long Island City 1, N. Y.
Marco Chemicals, Inc., Sewaren, N. J.
Marconetti, A. E. Inc., 11 W. 42nd St., New York, N. Y.
Markem Machine Co., 50 Emerald St., Keene, N. H.
Market Printing Co, 129 N. Halsted St., Chicago, Ill.
Marking Device Association, 134 N. La Salle St., Chicago 2, Ill.
Marking Devices Co., 107 Worth St., New York, N. Y.
Markley, Margery, 4 E. 48th St., New York 17, N. Y.
Marks Chemical Works, 20 West St., New York 10, N. Y.
Marsh, George, 833 Park Sq. Bldg., Boston, Mass.
Marsh Stencil Machine Co., Belleville, Ill.
Martial & Scull, 1 E. 53rd St., New York 19, N. Y.
Martin, Robt. E. & Co., 139 Merritts Ave., N. E., Atlanta, Ga.
Martindell Molding Co., Olden at 6th St., Trenton, N. J.
Marvellum Co., The, Appleton St., Holyoke, Mass.
Marvil Package Co., Laurel, Del.
Maryland Container Co., Inc., 1501–1515 Russell St., Baltimore, Md.
Maryland Glass Corp., Morrell Park Station, Baltimore, Md.
Maryland Paper Box Co., Leadenhall & Ostend Sts., Baltimore 30, Md.
Maryland Plastics, Inc., East Central Ave., Federalsburg, Md.
Mason Box Co., The, Attleboro Falls, Mass.
Mason Can Co., Dexter Rd., E. Providence, R. I.
Mason Envelope Co., 644 Broadway, New York 12, N. Y.
Mason, F. E. & Sons, Batavia, N. Y.
Mason, Thomas Co., Inc., Fairfield Ave., Stamford, Conn.
Master Craftsmen of the Set-up Paper Box Industry, 1106 Liberty Trust Bldg., Phila. 7, Pa.
Master Package Corp., The, Owen, Wis.
Master Plastic Molding Corp., 1609 N. Broadway, St. Louis 6, Mo.
Master Tool & Die Makers, 1170 Broadway, New York, N. Y.
Mathews Conveyer, 166 10th St., Ellwood City, Pa.
Matthews, James H. & Co., 3942 Forbes St., Pittsburgh 13, Pa.
Matthias Paper Corp., 165 W. Berks St., Phila. 22, Pa.
Maurer, Sascha A., 480 Lexington Ave., New York, N. Y.
Maxson Automatic Machinery Co., 23 Broad St., Westerly, R. I.
Mayer, Fred A., 2 Ellwood St., New York, N. Y.
McClandlish Lithograph Corp., Roberts Ave. & Stokley St., Phila., Pa.
McClintock Corp., The, 1550 Vernon St., Harrisburg, Pa.
McCoy Label Co., 608 Commercial St., San Francisco 11, Calif.
McCoy Paper Converters, 3rd & Huntingdon Sts., Phila. 33, Pa.
McDonald Mfg. Co., 544 E. 31st St., Los Angeles, Calif.
McEwan Bros., Inc., Whippany, N. J.
McGill Lithograph Co., 501 Seventh Ave., S., Minneapolis, Minn.
McGuire, Walter, 227 Franklin St., Bklyn, N. Y.
McInerney Plastics Co., 25 Commerce Ave., S. W., Grand Rapids, Mich.
McIntyre Bros. Paper Co., Inc., Fayetteville, N. Y.
McKay Co., 880 Pacific St., Bklyn 17, N. Y.
McLaurin-Jones Co., Mill St., Brookfield, Mass.
Mechanical Institute, 115 Cedar St., Boonton, N. J.
Mehl Mfg. Co., 2351 Ferguson Rd., Cincinnati 5, Ohio
Meier, Joshua, 36 E. 10th St., New York, N. Y.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Meissner Mfg. Co., Bellmont & 7th St., Mt. Carmel, Ill.
Mele Mfg. Co., Inc., 150 W. 22nd St., New York, N. Y.
Melind, Louis, 362 W. Chicago Ave., Chicago 10, Ill.
Melvina Can Co., 59-24 57th Drive, Maspeth, L. I., N. Y.
Mente & Co., Inc., 12th Floor, Q & C Bldg., New Orleans, La.
Mercer Paper Tube, Inc., 650 W. Ingham Ave., Trenton, N. J.
Mercer-Robinson Co., Inc., 30 Church St., New York 7, N. Y.
Merchant Suppliers Paper Co., 606 W. 49th St., New York, N. Y.
Mergenthaler Linotype Co., 29 Ryerson St., Bklyn, N. Y.
Merit Display Cards Co., 120 E. 11th St., New York, N. Y.
Merkle Corp., 2720 W. Susquehanna St., Phila., Pa.
Merrick Scale Mfg. Co., Summer St., Passaic, N. J.
Merrick Transparent Products, 10-09 43rd Ave., Long Island City, N. Y.
Metal Marker Mfg. Co., 1380 E. 40th St., Cleveland, Ohio
Metal Specialty Co., The, Este Ave. & B. & O. R.R., Winton Pl., Cincinnati, Ohio
Metasap Chemical Co., First & Essex, Harrison, N. J.
Metzig, William, 331 Madison Ave., New York, N. Y.
Meyer, Frank C. Co., 271 Lexington Ave., Bklyn, N. Y.
Meyer, Joseph H. Bros., 220 25th St., Bklyn, N. Y.
Meyercord Co., The, 5323 W. Lake St., Chicago 44, Ill.
Micamold Radio Corp., 1087 Flushing Ave., Bklyn, N. Y.
Michigan Carton Co., Battle Creek, Mich.
Michigan Lithographing Co., 1 Carlton Ave., S. E., Grand Rapids 6, Mich.
Michigan Molded Plastics, Inc., "G" & Baker Sts., Dexter, Mich.
Mico, Inc., Millerton, N. Y.
Middlesex Products Corp., 111 Putnam Ave., Cambridge 39, Mass.
Midland Bag Co., 5403 Bower Ave., Cleveland, Ohio
Midland Glue Products Co., 1478–88 Madison Ave., Detroit, Mich.
Mid-States Gummed Paper Co., 2515 S. Damen Ave., Chicago, Ill.
Mid-States Steel & Wire Co., College & Oak Sts., Crawfordsville, Ind.
Midwest Molding & Mfg. Co., 319 Whipple St., Chicago, Ill.
Miehle Printing Press Mfg. Co., 14th & Damen Ave., Chicago, Ill.
Milk Cap Statistical Bureau, 1532 Lincoln Liberty Bldg., Phila., Pa.
Miller & Miller, 136 Marietta St., N. W., Atlanta, Ga.
Miller Paper Co., 80 Wooster St., New York 12, N. Y.
Miller Printing Machinery Co., 1117 Reedsdale St., Pittsburgh 12, Pa.
Miller, Walter P. Co., Inc., 452 York Ave., Phila. 23, Pa.
Miller Wrapping & Sealing Machine Co., 18 S. Clinton St., Chicago 6, Ill.
Milhiser Bag Co., Richmond, Va.
Mill-O-Plast Co., 118 Walker St., New York, N. Y.
Mills, Elmer E. Corp., 153 W. Huron St., Chicago, Ill.
Milprint, Inc., 431 W. Florida St., Milwaukee, Wis.
Milton, Geo A. Can Co., Inc., 131–151 N. 14th St., Bklyn, N. Y.
Milwaukee Industrial Designers, 744 N. Fourth St., Milwaukee 3, Wis.
Milwaukee Label & Seal Co., 1027 N. Seventh St., Milwaukee 3, Wis.
Minerva Wax Paper Co., Minerva, Ohio
Minneapolis Plastic Co., 2300 E. 31st St., Minneapolis, Minn.
Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.
Minnesota Plastics Corp., 366 Wacouta St., St. Paul, Minn.
Miro Container Co., Inc., 557 Dekalb Ave., Bklyn 5, N. Y.
Miskella Infra-Red Co., E. 73rd & Grand Ave., Cleveland 4, Ohio
Missouri Bag Co., 1206–14 N. Main St., St. Louis 6, Mo.
Mitchell-Rand Mfg. Co., 51 Murray St., New York, N. Y.
Mobile Paper Mill Co., Crichton Station, Mobile, Ala.
Model Engraving Corp., 460 W. 34th St., New York, N. Y.
Modern Boxes, Inc., 4949 N. Pulaski Rd., Chicago 30, Ill.
Modern Containers Co., 3220 E. Olympic Blvd., Los Angeles 23, Calif.
Modern Machine Corp., 323 Berry St., Blkyn, N. Y.
Modern Machine & Tool Co., 401 E. 3rd St., Plainfield, N. J.
Modern Packages, Inc., 3022 E. Jackson Ave., Memphis, Tenn.
Modern Plastic Co., 4641 Pacific Blvd., Los Angeles, Calif.
Modern Plastics Corp., North Shore Drive, Benton Harbor, Mich.
Modglin Co., 3809 Eagle Rock Blvd., Los Angeles, Calif.
Mohawk Valley Paper Co., Inc., Little Falls, N. Y.
Moist-R-Proof Container Co., 1960 Hayes St., San Francisco, Calif.
Mojonnier Bros. Co., 4601 W. Ohio St., Chicago, Ill.
Molded Insulation Co., 335 E. Price St., Phila. 44, Pa.
Molded Products Co., 4533 W. Harrison St., Chicago, Ill.
Molding Corp. of America, Inc., 40 Church St., Pawtucket, R. I.
Molitor-Box Co., 392 Florida St., Milwaukee, Wis.
Mono Containers Div., Continental Can Co., 349 Oraton, Newark 4, N. J.
Monoplastics, Inc., Old Branchville Rd., Georgetown, Conn.
Monsanto Chemical Co., Plastics Div., 600 Monsanto Ave., Springfield 2, Mass.
Mont, Ben Papers, Inc., Mill St., Bennington, Vt.
Mooney & Mooney, Inc., 200 Wright St., Newark, N. J.
Morgan Bros., Richmond, Va.
Mor-Gan Laminating & Foliating Co., 30 E. 20th St., New York 3, N. Y.
Morrell, George Corp., Sherman Blvd., Muskegon Heights, Mich.
Morrill, Geo. H. Div., Sun Chemical Corp., 100 Sixth Ave., New York 13, N. Y.
Morris Paper Mills, 135 S. LaSalle St., Chicago 3, Ill.
Moser Bag & Paper Co., 3049–55 E. 55th St., Cleveland 4, Ohio
Moser Paper Box Co., 4511 N. Euclid Ave., St. Louis, Mo.
Mosinee Paper Mills Co., Mosinee, Wis.
Motion Displays, Inc., 29 Ryerson St., Bklyn, N. Y.
Mott Carton & Paper Co., 2234 Eugenia St., St. Louis 3, Mo.
Mount, Charles A., 3923 Taylor Ave., Cincinnati 9, Ohio
Moyer & Pratt, Inc., Lyons Falls, N. Y.
Muirson Label Co., Inc., 1085 Irving Ave., Bklyn 27, N. Y.
Muller-Munk, Peter, Clark Bldg., 717 Liberty Ave., Pittsburgh 17, Pa.
Multistamp Co., Inc., The, Norfolk, Va.
Mundet Cork Corp., Closure Div., 65 S. Eleventh St., Bklyn 11, N. Y.
Munson Bag Co., The, 1366 W. 117th St., Cleveland 7, Ohio
Murray & Scheiding, 151 E. 38th St., New York, N. Y.

Muskegon Paper Box Co., 997 W. Western Ave., Muskegon, Mich.
Mutual Paper Box Corp., 1500 W. Harrison St., Chicago 7, Ill.
Myers, J. & P. B. Inc., 26 Exchange Place, Jersey City, N. J.

N

Nalco, Inc., 203 E. 18th St., New York 3, N. Y.
Na-Mac Products Corp., 1027 N. Seward St., Hollywood, Calif.
Narragansett Coated Paper Corp., 730 York Ave., Pawtucket, R. I.
Nash, Ben, 15 Gramercy Park, New York, N. Y.
Nash, Jim, 405 E. 54th St., New York, 22, N. Y.
Nashua Gummed & Coated Paper Co., 44 Franklin St., Nashua, N. H.
Nashua Package Sealing Co., Inc., Nashua, N. H.
Natick Box & Board Co., Natick, Mass.
National Adhesives, 270 Madison Ave., New York 16, N. Y.
National Assn. of Display Industries, 710 W. Washington St., Chicago 6, Ill.
National Assn. of Food Chains, 726 Jackson Blvd., Washington, D. C.
National Assn. of Frozen Food Packers, 812 National Press Bldg., Washington 4, D. C.
National Assn. of Glue Mfrs., 55 W. 42nd St., New York, N. Y.
National Assn. of Mfrs., 14 W. 49th St., New York, N. Y.
National Assn. of Printing Ink Makers, 1440 Bway, New York, N. Y.
National Assn. of Sanitary Milk Bottle Closure Mfrs., 1532 Lincoln-Liberty Bldg., Phila., Pa.
National Bag Corp., 271 Madison Ave., New York, N. Y.
National Bread Wrapping Machine Co., 132 Birnie Ave., Springfield, Mass.
National Can Corp., 110 E. 42nd St., New York, N. Y.
National Canners Assn., 1739 H St., N. W., Washington, D. C.
National Canners Laboratory, 711 Pennsylvania Ave., Pittsburgh, Pa.
National Casein Sales, 601 W. 80th St., Chicago, Ill.
National Collapsible Tube Co., 362 Carpenter St., Providence 9, R. I.
National Color Printing Co., Inc., The, 930 E. Monument St., Baltimore 2, Md.
National Confectioners Assn., 224 S. Michigan, Chicago, Ill.
National Consumer Retailer Council, 8 W. 40th St., New York, N. Y.
National Container Assn., 205 W. Wacker Drive, Chicago, Ill.
National Container Corp., 30-01 Review Ave., Long Island City 1, N. Y.
National Dehydrators Assn., 35 E. Wacker Dr., Chicago 1, Ill.
National Fiberstok Envelope Co., 189 W. Allegheny Ave., Phila. 33, Pa.
National Fibre Can & Tube Assn., 41 E. 42nd St., New York, N. Y.
National Folding Box Co., P. O. Box 1004, New Haven 4, Conn.
National Food Distributors' Assn., 110 N. Franklin St., Chicago, Ill.
National Frozen Food Locker Assn., Streator, Ill.
National Industrial Advertisers Assn., 100 E. Ohio St., Chicago, Ill.
National Lock Co., 1902 7th St., Rockford, Ill.
National Meat Canners Assn., 3327 W. 47th St., Chicago 32, Ill.
National Metal Edge Box Co., 334 N. 12th St., Phila., Pa.
National Oil Products Co., 1st & Essex Sts., Harrison, N. J.
National Packaging Machinery Co. (See U. S. Automatic Box Machinery Co., Inc.)
National Paint, Varnish & Lacquer Assn., 1500 Rhode Island Ave., N. W., Washington, D. C.
National Paper Box Co., 20th St. & Tracy Ave., Kansas City, Mo.
National Paper Box Mfg. Co., 1346 N. Branch St., Chicago, Ill.
National Paper Box Manufacturers Assn., 1106 Liberty Trust Bldg., Phila., Pa.
National Paper Box Supplies Assn., P. O. Box 122, Summit, N. J.
National Paper Co., P. O. Box 1637, Atlanta 1, Ga.
National Paperboard Assn., 80 E. Jackson Blvd., Chicago, Ill.
National Plastics, Inc., 2330 McCalla Ave., Knoxville, Tenn.
National Printing & Engraving Co., 7 S. Dearborn St., Chicago, Ill.
National Process Co., 75 Varick St., New York 13, N. Y.
National Seal Corp., 14th Ave. & 37th St., Bklyn 18, N. Y.
National Tin Can Manufactory Co., 134 W. 3rd St., New York 12, N. Y.
National Transparent Plastics Co., 51 Front St., Springfield, Mass.
National Waterproofing Co., Front & Lane Sts., Camden, N. J.
National Wholesale Druggists Assn., 330 W. 42nd St., New York, N. Y.
National Wooden Box Assn., 308 Barr Bldg., Washington, D. C.
Naugatuck Chemical Div., U. S. Rubber Co. ,1230 Ave. of the Americas, New York 20, N. Y.
Neahr, M. J. & Co., 1600 S. Dearborn St., Chicago, Ill.
Nelson, B. F. Mfg. Co., The, 401 N. E. Main St. Minneapolis 13, Minn.
Neostyle, Inc., 410 N. Wabash Ave., Chicago 22, Ill.
Neubauer, Robert G. Inc., Southport, Conn.
Neumann, Robert Co., The, 1910-12 W. Eighth St., Cincinnati, Ohio
Nevins-Church Press, The, 250 Park Ave., New York, N. Y.
Newark Boxboard Co., Newark, N. J.
Newark Glassine Bag Co., 44 Jeliff Ave., Newark, N. J.
Newark Paper Box Co., 216 High St., Newark, N. J.
Newark Paraffine & Parchment Paper Co., 50 Jelliff Ave., Newark 8, N. J.
New Can Co., Inc., The, 200 Commercial St., Molden, Mass.
New England Box Co., The, 173 Main St., Greenfield, Mass.
New England Card & Paper Co., 12-30 Hanover St., Springfield, Mass.
New England Collapsible Tube Co., 3132 S. Canal St., Chicago, Ill.
New England Container Co., Meadow St., Chicopee, Mass.
New England Novelty Co., 98 Adams St., Leominster, Mass.
New Haven Pulp & Board Co., 259 East St., New Haven, Conn.
New Jersey Machine Corp., Willow Ave. at 16th St., Hoboken, N. J.
New Products Corp., North Shore, Benton Harbor, Mich.
Newton Carton, 27 Haynes Ave., Newark, N. J.
New York Laminating Co., 60 Woolsey St., Irvington, N. J.
New York Testing Laboratories, 80 Washington St., New York, N. Y.
Niagara Insul-Bake Specialty Co., Inc., 483-493 Delaware Ave., Albany, N. Y.
Niagara Lithograph Co., 1050 Niagara St., Buffalo, N. Y.
Nickelson, John, 155-17 Sanford Ave., Flushing, L. I., N. Y.
Nicoll & Co., 450 5th Ave., San Francisco, Calif.
Nielsen, Wm. R., 11 W. 42nd St., New York, N. Y.
Niemand Bros., Inc., 37-01-37-19 35th Ave., Long Island City, N. Y.
Nixon Nitration Works, Nixon, N. J.
Noble & Westbrook Mfg. Co., The, 20 Westbrook St., E. Hartford, Conn.
Nocatee-Manatee Crate Co., Manatee, Fla.
Nolan Paper Box Co., 2419 S. Grand Ave., Los Angeles 7, Calif.
Noon Bag Co., 34 N. W. First Ave., Portland 9, Ore.
North American Pulp & Paper Co., 220 E. 42nd St., New York, N. Y.
Northeastern Bag & Burlap Co., 531 E. 132 St., New York, N. Y.
Northeastern Distributors, Inc., 588 Commonwealth Ave., Boston, Mass.
Northeastern Molding, Inc., Dunnell Lane, Pawtucket, R. I.
Northeastern Plastics Corp., 584 Commonwealth Ave., Boston 15, Mass.
North End Paper Co., Fulton, N. Y.
Northern Industrial Chemical Co., 7 Elkins St., S. Boston 27, Mass.
Northern Paper Mills, Green Bay, Wis.
North State Paper Box Co., Statesville, N. C.
Northwest Canners Assn., 513 Board of Trade Bldg., Portland, Oregon
Northwest Plastics, Inc., 2233 University Ave., St. Paul, Minn.
Northwest Testing Laboratories, 2nd Ave. & James St., Seattle, Wash.
Northwestern Frozen Foods Assn., 513 Board of Trade Bldg., Portland, Ore.
Norton Laboratories, Inc., 520 Mill St., Lockport, N. Y.
Norwood Engineering Co., The, 12 N. Main St., Florence, Mass.
Nosco Plastics, Div. National Organ Supply Co., 17th & Cascade, Erie, Pa.
Nox-Rust Corp., 2429 S. Halsted St., Chicago 8, Ill.
Nussbaum Display Mfg. Co., Berne, Ind.
Nussbaum Novelty Co., 269 Jefferson St., Berne, Ind.

O

Oberly & Newell Lithograph Corp., 545 Pearl St., New York, N. Y.
Ohio Boxboard Co., The, Rittman, Ohio
Ohio Plastic Co., The, Frazeyburg, Ohio
Old Dominion Box Co., Inc., 528 Turner Ave., Charlotte 2, N. C.
Olive Can Co., 450 N. Leavitt St., Chicago, Ill.
Oliver Machinery Co., Packaging Div., Grand Rapids, Mich.
O'Malley, M. J. Co., Springfield, Mass.
Oneida Paper Products, Inc., 601 W. 26th St., New York 1, N. Y.
O'Neil, William, 11 E. 44th St., New York 17, N. Y.
Ontonagon Fibre Corp., Ontonagon, Mich.
Oris Mfg. Co., Inc., Jackson St., Thomaston, Conn.
Osborne, Raymond G. Laboratories, Rives-Strong Bldg., Los Angeles, Calif.
Oswego River Paper Mills, Phoenix, N. Y.
Ottawa River Paper Co., The, Matzinger Rd., Toledo, Ohio
Ottaway, C. L. Mfg. Co., 200 W. Pomona St., Monrovia, Calif.
Ou'serts, Inc., 11 W. 42nd St., New York, N. Y.
Owens-Illinois Can Co., Ohio Bldg., Toledo 1, Ohio
Owen-Illinois Glass Co., Ohio Bldg., Toledo 1, Ohio
Owens-Illinois Pacific Coast Co., 1855 Folsom St., San Francisco, Calif.
Oxford Paper Co., 230 Park Ave., New York 17, N. Y.

P

Pacific Can Co., 290 Division St., San Francisco 3, Calif.
Pacific Coast Paper Box Manufacturers Assn., 544 Market St., San Francisco, Calif.
Pacific Coast Paper Mills, Bellingham, Wash.
Pacific Designers, 1305 Brack Shops, Los Angeles 14, Calif.
Pacific Diamond H Bag Co., 315 Main St., San Francisco, Calif.
Pacific Label Co., 1231 S. Main St., Los Angeles 15, Calif.
Pacific Printing Ink Co., 416 Jackson St., San Francisco, Calif.
Pacific Veneer Package Assn., 915 Rust Bldg., Tacoma, Wash.
Package Machinery Co., 132 Birnie Ave., Springfield 7, Mass.
Package Materials Laboratories, Inc., 12-28 Broadway, Long Island City, N. Y.
Packaging Institute, Inc., 342 Madison Ave., New York 17, N. Y.
Packaging Machinery Mfrs. Inst., Inc., 342 Madison Ave., New York 17, N. Y.
Pack-Rite Machines, 714 W. Wisconsin Ave., Milwaukee 1, Wis.
Paige, Richard E. Inc., 28 W. 44th St., New York 18, N. Y.
Paisley Products, Inc., 1770 Canalport Ave., Chicago 16, Ill.
Palm Bros. Decalcomania Co., The, Regent, Spencer & Lexington Aves., Cincinnati 12, Ohio
Palm, Fechteler & Co., 220 W. 42nd St., New York 18, N. Y.
Palmer Development Laboratory, 528 N. Western Ave., Chicago 12, Ill.
Palmer, Frank D. Inc., 528 N. Western Ave., Chicago 12, Ill.
Palographia Co., The, 74 Lafayette St., New York 13, N. Y.
Paper Affiliates, Dept., Nalco, Inc., 203 E. 18th St., New York 3, N. Y.
Paper & Bag Inst. of the Pacific Coast, 311 California St., San Francisco, Calif.
Paper Bag Mfrs. Inst., 369 Lexington Ave., New York, N. Y.
Paper Box & Specialty Co., 1505 Sibley Court, Sheboygan, Wis.
Paper City Mfg. Co., Inc., 624 Hamden St., Holyoke, Mass.
Paper Container Mfg. Co., 1752 E. 75th St., Chicago 49, Ill.
Paper Converting Machine Co., 601 Harvey St., Green Bay, Wis.
Paper Cup & Container Institute Inc., 1790 Broadway, New York, N. Y.
Paper Manufacturers Co., 5th & Willow Sts., Phila. 23, Pa.
Paper Package Co., 802 S. Delaware St., Indianapolis, Ind.
Paper Pail Assn., 111 W. Washington St., Chicago 2, Ill.
Paper Shipping Sack Mfrs. Assn., 370 Lexington Ave., New York 17, N. Y.
Paraffined Carton Assn., 111 W. Washington St., Chicago 2, Ill.
Paragon Plastics, Inc., 911 Western Ave., Seattle, Wash.
Paragon Wood Turning Co., Inc., 431 West 28th St., New York, N. Y.
Paramount Paper Products Co., Inc., 19th & Hamilton Sts., Phila., Pa.
Parfait Sales Co., 1500 N. Ogden Ave., Chicago 10, Ill.
Park, Helen, 170 E. 51st St., New York 22, N. Y.
Parry, Samuel R. Machine Co., 224 Mill, Rochester, N. Y.
Parzinger, Tommi, 310 E. 55th St., New York, N. Y.
Paslode Co., 2628 N. Artesian Ave., Chicago, Ill.
Patent Button Co. of Tennessee, The, 2221 Century St., Knoxville, Tenn.
Paterson Parchment Paper Co., Bristol, Pa.
Paulis, H. Plastics Co., 217 E. Washington Blvd., Los Angeles 21, Calif.
Pedersen, H. Mfg. Co., 723 Crocker St., Los Angeles 21, Calif.
Peerless Molded Plastics, 410 Hamilton St., Toledo, Ohio
Peerless Packers, 533 Greenwich St., New York 13, N. Y.
Peerless Paper Mills, Inc., Oaks, Pa.
Peerless Roll Leaf Co., Inc., 4511-4513 New York Ave., Union City, N. J.
Peerless Tube Co., 58-76 Locust Ave., Bloomfield, N. J.
Pejepscot Paper Co., 420 Lexington Ave., New York 17, N. Y.
Penn Lithographing Co., 47th & Westminster Ave., Phila. 39, Pa.
Pennsylvania Glass Products Co., 428-432 N. Craig St., Pittsburgh, Pa.
Pequannock Valley Paper Co., Butler, N. J.
Perfect Finishing Co., Inc., 200 Varick St., New York, N. Y.

XUM

Perfection Plastic Products, 900 Passaic Ave., E. Newark, N. J.
PerfeKtum Products Co., 300 Fourth Ave., New York 10, N. Y.
Perfumers & Jewelers Box Co., 635 6th Ave., New York, N. Y.
Peter Partition Corp., 647 Lexington Ave., Bklyn 21, N. Y.
Peters Machinery Co., 4700 Ravenswood Ave., Chicago 40, Ill.
Peterson Bros., 165 N. Elizabeth St., Chicago 7, Ill.
Petroleum Specialties, Inc., 400 Madison Ave., New York 17, N. Y.
Petrolite Corp., Ltd., 29 Bway, New York 6, N. Y.
Petruccelli, Antonio, Mt. Tabor, N. J.
Pharmacy Paper Box Co., 3401 Division St., Chicago, Ill.
Phelps Can Co., Fulton & Eagle Sts., Baltimore Md.
Phenix Associates, 270 Lafayette St., New York, N. Y.
Philadelphia Can Co., 225 New St., Phila., Pa.
Philadelphia Carpenter Container Co., 1823 E. Venango St., Phila. 34, Pa.
Philadelphia Quartz Co., 126 S. Third St., Phila. 6, Pa.
Philipp Lithographing Co., 1422 N. 4th St., Milwaukee 12, Wis.
Phoenix Metal Cap Co., 2444 W. 16th St., Chicago 26, Ill.
Pictorial Paper Package Corp., 232 S. Lake St., Aurora, Ill.
Pie-Pak Co., Inc., 1300 Hudson St., Hoboken, N. J.
Pilliod Cabinet Co., The, Swanton, Ohio
Pine-Land Bag Corp., Inc., Pascagoula, Mass.
Pioneer Mounting & Finishing Co., Inc., 233 Spring St., New York, N. Y.
Pioneer Paper Box Co., 1417 Washington Ave., S., Minneapolis, Minn.
Pitkin, Lucius Inc., 47 Fulton St., New York, N. Y.
Pittsburgh Glass Co., Columbia Chem. Div., Grant Bldg., Pittsburgh 19, Pa.
Pittsburgh Plastics Co., 1304 5th Ave., New Kensington, Pa.
Pittsburgh Testing Laboratory, 1330 Locust St., Pittsburgh 19, Pa.
Place, Roland P. Co., 410 E. Hines St., Midland, Mich.
Plano Molding Co., 113 S. Center Ave., Plano, Ill.
Plaskon Div., Libbey-Owens-Ford Glass Co., 2112–24 Sylvan Ave., Toledo 6, Ohio
Plastal Specialties Co., 3215 Western Ave., Seattle 99, Wash.
Plas-Tex Corp., 653 N. Robertson Blvd., Los Angeles, Calif.
Plastic Art Craft, 131 W. 97th St., New York 25, N. Y.
Plastic Co., Inc., 7457 Melrose Ave., Los Angeles, Calif.
Plastic Coating Corp., The, Holyoke, Mass.
Plastic & Die Cast Products Corp., 1010 E. 62nd St., Los Angeles, Calif.
Plastic Engineering, Inc., 8506 Lake Ave., Cleveland 2, Ohio
Plastic Film Corp., Plainfield, Conn.
Plastic Industries, Inc., Mogadore Rd., Kent, Ohio
Plastic Inlays, Inc., 282 Broad St., Summit, N. J.
Plastic Mfrs., Inc., 280 Fairfield Ave., Stamford, Conn.
Plastic Molded Arts, Inc., 12-04 44th Ave., Long Island City, N. Y.
Plastic Molding Corp., Sandy Hook, Conn.
Plastic Moldings Corp., 859 Hathaway St., Cincinnati, Ohio
Plastic Products, Inc., 6473 Georgia Ave., Detroit, Mich.
Plastic Products, Inc., 415 Lexington Ave., New York 17, N. Y.
Plastic Products Manufacturers Assn., 1133 Bway, New York, N. Y.
Plastic & Rubber Products Co., 2100 Hyde Park Blvd., Los Angeles, Calif.
Plastic Turning Co., Inc., Leominster, Mass.
Plastic-Ware, Inc., 238 Williams St., New York, N. Y.
Plasticraft Associates, 155 E. Ohio St., Chicago, Ill.
Plastics Engineering Co., 1603 Geele Ave., Sheboygan, Wis.
Plastics, Inc., 813 Main St., Bradley Beach, N. J.
Plastics, Inc., 20 E. Chicago Ave., St. Paul, Minn.
Plastics Materials Manufacturers Assn., Tower Bldg., 14th & K Sts., Washington, D. C.
Plastics Research Foundation, 3318 Lake Shore Drive, Chicago, Ill.
Plastimold, Inc., P. O. Box 628, Attleboro, Mass.
Platt Corp., 1415 Key Highway, Baltimore, Md.
Plax Corp., Hartford, Conn.
Plax-Tex Engineering Corp., 8 Morris St., Paterson, N. J.
Plumly, Eugene K. Co., 1325 Federal St., Phila., Pa.
Plumly, George W. Co., Inc., 417 N. 8th St., Phila., Pa.
Plywood Package Inst., 19 W. 44th St., New York, N. Y.
Pneumatic Scale Corp., Ltd., 77 Newport Ave., N. Quincy, Mass.
Pohlig Bros., 2411 E. Franklin St., Richmond, Va.
Poinsettia, Inc., 98 Cedar Ave., Pitman, N. J.
Point of Purchase Advtg. Inst., 52 Vanderbilt Ave., New York, N. Y.
Pollock Paper & Box Co., 2236 S. Lamar St., Dallas, Texas
Pontiac Varnish Co., Pontiac, Mich.
Pope & Gray, Inc., 95 Morton St., New York 14, N. Y.
Port Huron Sulphite & Paper Co., Foot of Washington Ave., Port Huron, Mich.
Post & Johnson, Inc., 71 Church St., Hartford, Conn.
Potdevin Machine Co., 1221 38th St., Bklyn 18, N. Y.
Potter & Brumfield Mfg. Co., Inc., 615–17 N. Gibson St., Princeton, Ind.
Powers Products, Inc., 6121 S. Wentworth Ave., Chicago 21, Ill.
Precision Molded Plastics Co., Inc., 2014 W. 53rd St., Cleveland, Ohio
Precision Plastics Co., 4655 Stenton Ave., Phila. 44, Pa.
Premier Bag Co., Newark & Page Aves., Lyndhurst, N. J.
Prentiss, Geo W. & Co., 439 Dwight St., Holyoke, Mass.
Prescott, J. L. Co., Passaic, N. J.
Presstite Engineering Co., 3900 Chouteau Ave., St. Louis 10, Mo.
Price, M. B. Associates, 3108 Empire State Bldg., New York, N. Y.
Print-A-Tube Co., 44 Lexington Ave., Passaic, N. J.
Printloid, Inc., 93 Mercer St., New York 12, N. Y.
Process Displays, Inc., 1025 N. Water St., Milwaukee 2, Wis.
Producers Dealers Supply Co., Market & Front Sts., Boston, Mass.
Product, Industrial and Engineering Design Co., 33 W. 42nd St., New York, N. Y.
Progress Lithographing Co., The, Reading, Cincinnati 15, Ohio
Progressive Bag Co., Inc., 67 Franklin St., New Haven, Conn.
Pro-phy-lac-tic Brush Co., Pine St., Florence, Mass.
Proprietary Assn., 810 18th St., N. W., Washington, D. C.
Protective Coatings Corp., 689 Main St., Belleville 9, N. J.
Protective Coatings, Inc., P. O. Box 56, Strathmoor Station, Detroit, Mich.
Protective Packaging Corp., 175 Waverly Ave., Newark, N. J.
Pulp Reproduction Co., 3000 W. Clarke St., Milwaukee, Wis.
Purinton Pottery Co., Box 183, Shippenville, Pa.
Pyro Plastics Co., The, 526 North Ave., E. Westfield, N. J.
Pyrotex Leather Co., 287 Whitney St., Leominster, Mass.
Pyroxylin Products, Inc., 4851 S. St. Louis Ave., Chicago 32, Ill.

Q

Quality Park Box Co., 450 N. Syndicate St., St. Paul, Minn.
Quartin Specialty Box Co., 198 Hopkins St., Bklyn, N. Y.
Queen City Paper Co., 520 Bway, Cincinnati, The Ohio
Quincy Paper Box Co., 230 N. Third St., Quincy, Ill.
Quinn, Don L. Co., 609 N. La Salle St., Chicago, Ill.

R

R. C. Can Co., 101–121 Chambers St., St. Louis 6, Mo.
Racine Universal Motor Co., 1637 Gould St., Racine, Wis.
Racquette River Paper Co., The, Potsdam, N. Y.
Rainbow Lithographing Co., The, 4142 Airport Rd., Cincinnati 26, Ohio
Ralston, W. & Co., Inc., 921 Whirlpool St., Niagara Falls, N. Y.
Randolph Box & Label Co., 843 W. Van Buren St., Chicago, Ill.
Rapids-Standard Co., Inc., The, Bond Ave. & Trowbridge St., Grand Rapids, Mich.
Rathbun Molding Corp., 290 Rochester St., Salamanca, N. Y.
Ray, Ellen Laboratories, 95 Lorimer St., Bklyn, N. Y.
Raymond Bag Co., Tytus Ave. & Enoch Dr., Middletown, Ohio
Raymond Laboratory, Inc., 261 E. 5th St., St. Paul, Minn.
Rayon Processing Co. of R. I., 115 Tremont St., Central Falls, R. I.
Read, F. A., Inc., Albion, N. Y.
Recto Molded Products, Inc., Appleton & B. & O.-R.R., Cincinnati, Ohio
Redington, F. B. Co., 108 S. Sangamon St., Chicago 7, Ill.
Reed Container Sales Corp., 522 5th Ave., New York, N. Y.
Reed Tissues Corp., E. Mill St., Little Falls, N. Y.
Reilly Tar & Chemical Corp., Merchants Bank Bldg., Indianapolis 4, Ind.
Reinhold, F. E. Co., 7001 McKinley Ave., Los Angeles, Calif.
Reinhold-Gould, Inc., 535 Fifth Ave., New York, N. Y.
Remler Co., Ltd., 2101 Bryant St., San Francisco, Calif.
Republic Paperboard Co., The, 3347 Madison Rd., Cincinnati, Ohio
Republic Steel Corp., Republic Bldg., Cleveland 1, Ohio
Resina Automatic Machinery Co., Inc., 125 Wolcott St., Bklyn, N. Y.
Resinous Products & Chemical Co., The, 222 W. Washington Sq., Phila. 5, Pa.
Resistoflex Corp., Belleville, N. J.
Ressinger, Paul, 8 S. Michigan Ave., Chicago, Ill.
Rexford Paper Co., 1715 W. Canal St., Milwaukee 3, Wis.
Reyburn Mfg. Co., Inc., The, 16th St., & Indiana Ave., Phila. 32, Pa.
Reynolds Metals Co., Richmond 19, Va.
Reynolds Spring Co., Molded Plastics Div., Cambridge, Ohio
Rheem Mfg. Co., 370 Lexington Ave., New York, N. Y.
Rhinelander Paper Co., Rhinelander, Wis.
Richardson Co., The, 27th & Lake Sts., Melrose Park, Ill.
Richardson Taylor Globe Corp., 4501 Mitchell Ave., Cincinnati, Ohio
Rideout, John Gordon, Crestwood Farms, Chagrin Falls, Ohio
Ridgway Lithograph Co., 115 Boren Ave., N., Seattle 9, Wash.
Riegel Paper Corp., 342 Madison Ave., New York 17, N. Y.
Rinkle Krinkle Paper Co., 326 A St., Boston, Mass.
Ripley Co., Inc., Industrial Controls Div., Torrington, Conn.
Ritchie, W. C. & Co., 8801 S. Baltimore Ave., Chicago 17, Ill.
River Valley Tissue Mills, Inc., Phoenix, N. Y.
Riverside Mfg. Co., Murfreesboro, N. C.
Roberts, Lewis Inc., 72 Union St., Newark 5, N. J.
Robertson Can Co., 14 N. Lowry Ave., Springfield, Ohio
Robertson Co., The, Hinsdale, N. H.
Robertson, G. E. & Co., Hinsdale, N. H.
Robertson Paper Box Co., Inc., Montville, Conn.
Robinson, A. E. & Co., 605 W. Washington St., Chicago, Ill.
Robinson Clay Product Co., 101 Park Ave., New York 17, N. Y.
Robinson-Spear Corp., 345 W. 40th St., New York, N. Y.
Robinson Tag & Label Co., 460 W. 34th St., New York, N. Y.
Rochester Folding Box Co., P. O. Box 1012, Rochester, N. Y.
Rock City Paper Box Co., 800 12th Ave., No., Nashville 4, Tenn.
Rock Mfg. Co., Central St., Stoughton, Mass.
Rockford Fibre Container Co., Rockford, Ill.
Rocky Mountain Bank Note Co., 1088 Delaware St., Denver, Colo.
Rode & Brand, 200 William St., New York, N. Y.
Roesch, Louis Co., 1886 Mission St., San Francisco 3, Calif.
Rogan Bros., 180 N. Wacker Drive, Chicago, Ill.
Rogers, Edward H. Inc., 292 Ave. B, New York, N. Y.
Rogers Corp., 111 Mill St., Manchester, Conn.
Rogers Paper Mfg. Co., Manchester, Conn.
Rogers, V. F., 2454 15th St., Denver 11, Colo.
Rohde, Gilbert, 22 E. 60th St., New York 22, N. Y.
Rohm & Haas Co., Inc., 222 W. Washington Sq., Phila. 5, Pa.
Roll Leaf Mfrs. Assn., 25 W. 43rd St., New York, N. Y.
Roman, Martin L. Co., The, 146 W. 25th St., New York 1, N. Y.
Rondout Paper Mills, Inc., Napanoch, N. Y.
Roosen, H. D. Co., 78 20th St., Bklyn 32, N. Y.
Rosner Container Co., 143 Greene St., New York, N. Y.
Ross, A. H. Co., Inc., Ludlow, Ky.
Ross Paper Box Co., 449–451 W. 30th St., New York, N. Y.
Rossotti Lithographing Co., Inc., 8511 Tonnelle Ave., N. Bergen, N. J.
Rotogravure Div., Sun Chemical Corp., 100 6th Ave., New York 13, N. Y.
Rotogravure Engineering Co., 7614 Empire State Bldg., New York, N. Y.
Roto-Lith, Ltd., 30 W. 13th St., New York 11, N. Y.
Rowell, E. N. Co., Inc., Batavia, N. Y.
Royal Moulding Co., 69 Gordon Ave., Providence, R. I.
Royal Paper Box Co., 1136 S. Los Angeles St., Los Angeles 15, Calif.
Royal Paper Corp., 210–216 11th Ave., New York 1, N. Y.
Royal, Thomas M. & Co., 5800 N. 7th St., Phila. 20, Pa.
Rubin, Joseph & Sons, Inc., 35 Meserole Ave., Bklyn, N. Y.
Ruckelshaus & Co., Inc., 545 5th Ave., New York, N. Y.
Rudnick, A. & A. Inc., 342 W. 14th St., New York, N. Y.
Rushmore Paper Mills, Inc., Natural Dam, New York
Russell Products Co., Harrison Bldg., Phila., Pa.
Rutherford Machinery Co., Div. Sun Chemical Corp., 110 6th Ave., New York 13, N. Y.

S

Sacramento Bag Mfg. Co., 810 Second St., Sacramento, Calif.
Safe-ty Socket Co., 306 S. State St., Gibson City, Ill.
Safeway Products Corp., 34 Union Sq., New York, N. Y.
Sager Bros., 42 W. 15th St., New York 11, N. Y.
St. Joe Machines, Inc., St. Joseph, Mich.

St. Louis Lithographing Co., 6801 S. Broadway, St. Louis, Mo.
St. Louis Plastic Moulding Co., 3515 N. Florissant, St. Louis, Mo.
St. Louis Sticker Co., 1906 Pine St., St. Louis, Mo.
St. Regis Paper Co., 230 Park Ave., New York 17, N. Y.
Sakier, George, 9 E. 57th St., New York 22, N. Y.
Sale Lithograph Co., 208–220 Washington St., Buffalo 3, N. Y.
Salisbury Mfg. Co., 501 Roosevelt Ave., Central Falls, R. I.
Salwen, Joe Paper Products Corp., 245 W. 67th St., New York 23, N. Y.
Salz Bros., Inc., 44 W. 28th St., New York, N. Y.
Sample-Durick Co., Inc., P. O. Box 207, Chicopee, Mass.
Sanders, Morris B., 2102 Suitland Terrace, S. E., Apt. 302, Washington, D. C.
Sanderson Products, Inc., 48 W. 48th St., New York, N. Y.
Sanitary Paper Mills, Inc., E. Hartford, Conn.
Santay Corp., 351 N. Crawford Ave., Chicago, Ill.
Saranac Machine Co., 376 W. Main, Benton Harbor, Mich.
Sav-Way Industries, 4875 E. Eight Mile Rd., Detroit 13, Mich.
Scandia Mfg. Co., 500 Belleville Turnpike, N. Arlington, N. J.
Scandore Paper Box Co., Steuben St. & Park Ave., Bklyn, N. Y.
Schawinsky, Xanti, 31 Washington Square W., New York 11, N. Y.
Schleicher, F. J. Paper Box Co., 1811 Chouteau Ave., St. Louis 3, Mo.
Schmeer's Paper Box Co., Inc., 204 Herald Place, Syracuse, N. Y.
Schmidt & Ault Paper Co., 423 King's Mill Rd., York, Pa.
Schmidt Bros. Co., 912 Brown St., Phila., Pa.
Schmidt, Henry & Bro., Inc., 875 N. 28th St., Phila. 30, Pa.
Schmidt Lithograph Co., 461—2nd St., San Francisco, Calif.
Schmitt, George & Co., 253 Maujer St., Bklyn, N. Y.
Schneider Bros. Co., 912 Brown St., Phila., Pa.
Schnier, I. F. Co., 683 Bryant St., San Francisco 7, Calif.
Schoettle, Edwin J. Co., 533 N. 11th St., Phila., Pa.
Schorsch & Co., Inc., 120 Bruckner Blvd., New York 54, N. Y.
Schulz, A. Geo. Co., 433 W. Clybourn St., Milwaukee 1, Wis.
Schunak, C. E. Inc., 470 Center St., Meriden, Conn.
Schurmann, F. A. Inc., 449 Troutman St., Bklyn, N. Y.
Schusterman, Wm. V., 1280 Ocean Ave., Bklyn, N. Y.
Schutz, Thomas A. Co., 201 N. Wells St., Chicago, Ill.
Schutz Bros., 152 Chamber St., New York, N. Y.
Schwarm & Jacobus Co., The, 1216 Jackson St., Cincinnati, Ohio
Schwerdtle Stamp Co., 9 Cannon St., Bridgeport, Conn.
Scientific Filter Co., 1 Franklin Sq., New York, N. Y.
Scott, Geo. S. Mfg. Co., The, W. Main St., Plantsville, Conn.
Scott & McDonald, Inc., 45 William St., Everett 49, Mass.
Scovill Mfg. Co., 99 Mill St., Waterbury, Conn.
Seal, Inc., 8 Brook, Shelton, Conn.
Seal-Craft, Inc., 215 Central Ave., Newark 4, N. J.
Sealright Co., Inc., First St., Fulton, N. Y.
Seal-Spout Corp., 361 Jelliff Ave., Newark 8, N. J.
Seaman Box Co., Inc., 443 Greenwich St., New York 13, N. Y.
Sears, Merle Paper Box Co., 1024 Industrial Ave., Danville, Ill.
Security Bag Co., The, Lock & Cooper Sts., Cincinnati (Lockland), Ohio
Seder & Son Molded Products Co., 324 S. Meldrum St., Ft. Collins, Colo.
Seeley Tube & Box Co., 170 Thomas St., Newark, N. J.
Sefton Fibre Can Co., 3275 Big Bend Blvd., St. Louis 17, Mo.
Seibert Varnish Co., 645 Strong St., Detroit, Mich.
Seinsheimer Paper Corp., Colerain, Alfred & Cook Sts., Cincinnati, Ohio
Self-Locking Carton Co., 589 E. Illinois St., Chicago, Ill.
Senoso Paper Co., Inc., Phoenix, N. Y.
Service Paper Box Co., 309 N. 3rd St., St. Louis 2, Mo.
Sexton Can Co., Inc., 31 Cross St., Everett, Mass.
Seymour & Peck Co., P. O. Box 5609, Chicago 80, Ill.
Seymour Products Co., The, River St., Seymour, Conn.
Seymour's & Co., 101 S. Wells St., Chicago, Ill.
Shampain, Citron, Clark, Inc., 43 York St., Bklyn 1, N. Y.
Shamrock Co., The, 1425 W. 15th St., St. Louis 6, Mo.
Shaw Insulator Co., 150 Coit St. Irvington, N. J.
Shaw Paper Box Co., 37 Sabin St., Pawtucket, R. I.
Shaw-Randall Co., 37 Sabin St., Pawtucket, R. I.
Shawmut Waxed Paper Co., Holliston, Mass.
Shawprint, Inc., Chelmsford St., Lowell, Mass.
Shearer-Neumann Co., 2820–32 Beekman St., Cincinnati, Ohio
Sheller Mfg. Corp., Portland, Ind.
Shellmar Products Corp., Mt. Vernon, Ohio
Shepherd, J. H. Son & Co., 1820 East Ave., Elyria, Ohio
Sherman Paper Products Corp., Newton Upper Falls, Mass.
Shomer-Majestic Box Corp., 510 5th Ave., New York, N. Y.
Shopsin Paper Co., 112 Charlton St., New York 14, N. Y.
Shoup-Owens, Inc., 1100 Adams St., Hoboken, N. J.
Shultz Folding Box Co., Inc., 11th & Pestalozzi Sts., St. Louis, Mo.
Shuman, Frank G. Co., The, 600 W. Jackson Blvd., Chicago 6, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York 12, N. Y.
Siebold, J. H. & G. B., Inc., 47 Watts St., New York, N. Y.
Siegel, A. L. Co., Inc., 274 Lafayette St., Newark, N. J.
Signode Steel Strapping Co., 2600 N. Western Ave., Chicago 47, Ill.
Sillcocks-Miller Co., The, 10 W. Parker Ave., S. Orange, N. J.
Simco Co., The, 4929 York Rd., Phila., Pa.
Simon Adhesive Products Corp., 220 Fifth Ave., New York 1, N. Y.
Simplex Paper Box Corp., Janet & Marshall Ave., Lancaster, Pa.
Simplex Texture Reproductions, Inc., 225 Varick St., New York, N. Y.
Simplex Wrapping Machine Co., 534 23rd Ave., Oakland 3, Calif.
Simpson & Doeller Co., 2827 E. Preston St., Baltimore 13, Md.
Sinclair & Carroll Co., 591 11th Ave., New York, N. Y.
Sinclair & Valentine Co., 611 W. 129th St., New York 27, N. Y.
Sinel, Joseph, 6 E. 45th St., New York, N. Y.
Singer Sewing Machine Co., 149 Bway, New York, N. Y.
Single Service Containers, Inc., 205 E. 42nd St., New York 17, N. Y.
Sisalkraft Co., The, 205 W. Wacker Drive, Chicago 6, Ill.
Sleight Metallic Ink Co., 538 N. 3rd St., Phila., Pa.
Slichter Box Co., Inc., 126 S. Church St., Mohnton, Pa.
Smeallie & Boorhees, Inc., Amsterdam, N. Y.
Smith, H. P. Paper Co., 5001 W. 66th St., Chicago 38, Ill.
Smith, S. K. Co., The, 2857 N. Western Ave., Chicago 18, Ill.
Smith-Emery Co., 920 Santee St., Los Angeles 15, Calif.; 651 Howard St., San Francisco, Calif.
Smith-Lustig Paper Box Mfg. Co., The, 2165 E. 31st St., Cleveland, Ohio
Smith & Winchester Mfg. Co., The, S. Windham, Conn.
Smithe, F. L. Machine Co., Inc., 645 W. 44th St., New York, N. Y.
Snyder & Black, Inc., 200 William St., New York, N. Y.
Snyder, Geo. H. Inc., 3631 N. Smedley St., Phila., Pa.
Sobenite, Inc., 1344 W. Sample St., South Bend, Ind.
Society of Designers for Industry, 17 E. 42nd St., New York, N. Y.
Society of the Plastics Industry, 295 Madison Ave., New York, N. Y.
Socony-Vacuum Oil Co., Inc., 26 Bway, New York, N. Y.
Sonoco Products Co., Hartsville, S. C.
Southern Box & Crate Assn., 313 City Bank Bldg., Shreveport, La.
Southern California Bag Co., 1328 Santa Fe Ave., Los Angeles, Calif.
Southern Kraft Div., International Paper Co., 220 E. 42nd St., New York, N. Y.
Southern Package Corp., Hazlehurst, Miss.
Southern Paper Co., Ltd., 535 Tchoupitoulas St., New Orleans, La.
Southern Plastics Co., 911 Huger St., Columbia 8, S. C.
Southern States Bag Co., Jacksonville, Fla.
Southern Waxed Paper Co., 840 Woodrow Ave., S. W. Atlanta, Ga.
Southwest Machine & Plastic Co., 5419 McKinley Ave., Los Angeles, Calif.
Spaulding China Co., Inc., Sebring, Ohio
Spear Box Co., Inc., 270 Eleventh Ave., New York 1, N. Y.
Specialty Insulation Mfg. Co., Inc., 55 Center St., Hoosick Falls, N. Y.
Specialty Paper Box Co., 255 McKibben St., Bklyn, New York
Specialty Papers Co., The, 802 Miami Chapel Rd., Dayton 1, Ohio.
Speedway Mfg. Co., 1834 S. 52nd Ave., Cicero, Ill.
Speedways Conveyors, Inc., 1268 Niagara St., Buffalo 13, N. Y.
Spence-Rigolo, Inc., 677 Fifth Ave., New York 22, N. Y.
Sponge Rubber Products Co., The, 246 Derby Place, Shelton, Conn.
Springfield Coated Paper Corp., 9th & Bailey Sts., Camden, N. J.
Sprosty, Dan A. Bag Co., The, 934 Lakewood Ave., Baltimore 24, Md.
Sprowles & Allen, Inc., York & Jasper Sts., Phila. 25, Pa.
Spuehler, Ernst A., 540 N. Michigan Ave., Chicago, Ill.
Standard Can Co., 2655 W. Van Buren St., Chicago, Ill.
Standard Cap & Molding Co., Inc., 307 S. Eaton St., Baltimore, Md.
Standard Conveyor Co., 315 N. W. 2nd, N. St. Paul 9, Minn.
Standard Insulation Co., 74 Paterson Ave., E. Rutherford, N. J.
Standard-Knapp Corp., Portland, Conn.
Standard Molding Co., Baltimore, Md.
Standard Novelty Box Co., Inc., 385 Girard Ave., New York, N. Y.
Standard Paper Box Co., 426 Cass Ave., Detroit 26, Mich.
Standard Paper Box Corp., 3837 Broadway Place, Los Angeles 41, Calif.
Standard Plastics Co., 62 Water St., Attleboro, Mass.
Standard Process Corp., 734 W. Lexington St., Chicago 7, Ill.
Standard Products Co., The, Thermo-Plastics Div., 505 Boulevard Bldg., Detroit, Mich.
Standard Specialty & Tube Co., Lower Penn Ave., New Brighton, Pa.
Stanley Works, The, 195 Lake St., New Britain, Conn.
Stapling Machines Co., 21 Pine St., Rockaway, N. J.
Star Case Co., 76 Madison Ave., New York, N. Y.
Stark Bros. Ribbon Co., 24 W. 40th St., New York, N. Y.
Staude, E. G. Mfg. Co., 2675 University Ave., St. Paul, Minn.
Sta-Warm Electric Co., Ravenna, Ohio
Stecher-Traung Lithograph Corp., 274 N. Goodman St., Rochester 7, N. Y.
Stecker Paper Box Co., 1420 W. 4th St., Detroit, Mich.
Steel Package Mfrs. Inst., 2134 Keith Bldg., Cleveland, Ohio
Steel & Tin Products Co., Inc., President & Faun Sts., Baltimore, Md.
Steiles, H. A. & Co., 174 Portland St., Boston, Mass.
Stein, A. & Co., 1143 W. Congress St., Chicago, Ill.
Stein, Hall & Co., Inc., 285 Madison Ave., New York 17, N. Y.
Steinweiss, Alex, 527 Riverside Drive, New York 27, N. Y.
Stengren, Jon, 6140 Saunders St., Forest Hills, N. Y.
Stensgaard, W. L. & Associates, 346 N. Justine St., Chicago 7, Ill.
Sterling Bag Co., 11 Green Lane, Bklyn, N. Y.
Sterling Bag Co., Inc., 40 Worth St., New York, N. Y.
Sterling Injection Molding, Inc., 277 Military Rd., Buffalo 7, N. Y.
Sterling Offset Co., 146 W. 25th St., New York 1, N. Y.
Sterling Plastics Co., 1140 Commerce Ave., Union, N. J.
Sterling Seal Co., P. O. Box 589, Erie, Pa.
Sterling-Wasser Box Co., 221 W. 7th Ave., Homestead, Pa.
Sterrett, D. B. Co., 56 Pearl St., Bklyn, N. Y.
Stevens & Thompson Paper Co., Greenwich, N. Y.
Stevens, C. E. Bros., Inc., 12 W. Barre St., Baltimore, Md.
Stevens, Nelson Paper Corp., 109 E. 31st St., New York, N. Y.
Stevens-Wiley Mfg. Co., Inc., The, Hancock & W. Berks Sts., Phila., Pa.
Stokes, F. J. Machine Co., 5990 Tabor Rd., Phila. 20, Pa.
Stokes, Joseph Rubber Co., 322 Webster St., Trenton, N. J.
Stokes & Smith Co., Frankford, Phila. 24, Pa.
Strange, John Paper Co., Menasha, Wis.
Strobridge Lithographing Co., The, Cincinnati (Norwood), Ohio
Strong, Cobb & Co., Inc., Lisbon Road & Evans Ave., Cleveland, Ohio
Strouse, Adler Co., 78 Olive St., New Haven 7, Conn.
Stuber & Kuck Co., 2800 S. Adams St., Peoria 1, Ill.
Style Molders, Inc., 353 McKibben, Bklyn, N. Y.
Sulik Mfg. Co., 412 River St., Seattle, Wash.
Sun Chemical Corp., 100 Sixth Ave., New York 13, N. Y.
Sun Tube Corp., 181 Long Ave., Hillside 5, N. J.
Superior Can Co., Inc., 90 Varick Ave., Bklyn, N. Y.
Superior Folding Box Co., 4170 Geraldine Ave., St. Louis, Mo.
Superior-Lawrence Bag Co., Inc., 370 Lexington Ave., New York, N. Y.
Superior Marking Equipment, 1800 W. Larchmont St., Chicago 13, Ill.
Superior Paper Products Co., Pittsburgh, Pa.
Superior Plastic Co., 643 N. Kedzie Ave., Chicago, Ill.
Superior Printing Ink Co., Inc., 295 Lafayette St., New York 12, N. Y.
Super-Seal Container Corp., 401 Southern Bldg., Washington, D. C.
Sutherland Paper Co., 243 E. Paterson St., Kalamazoo 13-D, Mich.
Sutnar, Flint & Hall, 17 John St., New York, N. Y.
Swan Metal Cap Co., 108 N. Jefferson St., Chicago, Ill.
Sweet Bros. Paper Mfg. Co., Phoenix, N. Y.
Sweetnam, Geo. H. Inc., 286 Portland St., Cambridge, Mass.
Swibold, Duane, 6432 Cass Ave., Detroit 2, Mich.
Swift, G. W. Jr., Inc., Trenton Pike, Bordentown, N. J.
Swindell Bros., Bayard & Russell Sts., Baltimore 30, Md.
Sylvania Industrial Corp., 122 E. 42nd St., New York 17, N. Y.
Synthetic Molded Products, Inc., Tower Hill Rd., Wakefield, R. I.

XUM

Synthetic Plastics Co., 88 St. Francis St., Newark, N. J.
Syntron Co., P. O. Box 2200, Homer City, Pa.
Synvar Corp., 103 Lombard St., Wilmington, Del.

T

Taber Instrument Corp., 111 Goundry St.,] N. Tonawanda, N. Y.
Tablet & Ticket Co., The, 1021 W. Adams St., Chicago 7, Ill.
Taffel Bros., Inc., 95 Madison Ave., New York, N. Y.
Talmadge Printing Co., 23 Ferry St., New York 7, N. Y.
Tamm & Co., 61 E. 11th St., New York, N. Y.
Tanglefoot Co., The, 314 Straight St., Grand Rapids 4, Mich.
Tanzi, Aurelio Engineering Co., 430 Jefferson St., Bklyn, N. Y.
Tarpey, Thomas, 1017 Nelson Ave., New York 52, N. Y.
Taylor Box Co., 73 Eagle St., Providence, R. I.
Tech-Art Plastics Co., 41-01 36th Ave., Long Island City, N. Y.
Technical Assn. of the Pulp & Paper Industry, 122 E. 42nd St., New York, N. Y.
Telex Products Co., Telex Park, Minneapolis, Minn.
Tennessee Eastman Corp., Kingsport, Tenn.
Tennessee Paper Mills, Chattanooga, Tenn.
Tension Envelope Corp., 19th & Campbell Sts., Kansas City 8, Mo.
Terkelsen Machine Co., 326 A St., Boston 10, Mass.
Terre Paper Box Co., 1824 S. Bishop St., Chicago, Ill.
Texas Paper Box Mfg. Co., 2013 Federal St., Dallas, Texas
Textile Bag Mfrs. Assn., 100 N. LaSalle St., Chicago, Ill.
Textile Color Card Assn., 200 Madison Ave., New York, N. Y.
Textileather Corp., 607 Madison Ave., Toledo 3, Ohio
Thatcher Mfg. Co., Elmira, N. Y.
Ther Electric & Machine Works, 17 S. Jefferson St., Chicago, Ill.
Thilmany Pulp & Paper Co., Kaukauna, Wis.
Thoma Paper Box Co., Inc., 642–658 Clinton St., Buffalo, N. Y.
Thompson Can Co., 1304 So. Austin St., Dallas 2, Texas
Thwing-Albert Instrument Co., 5396 Pulaski Ave., Phila. 44, Pa.
Tight Closure Co., 3056 West Meinecke Ave., Milwaukee, Wis.
Tilton & Cook Co., 38 Spruce St., Leominster, Mass.
Tissue Co., Saugerties, N. Y.
Titian Plastic Products Co., 1221 West 11th St., Los Angeles, Calif.
Tobias, Max N. Co., 328 Cortez St., New Orleans, La.
Toilet Goods Assn., 9 Rockefeller Plaza, New York, N. Y.
Toledo Paper Box Co., 1112–24 True St., Toledo 1, Ohio
Toledo Plastics Co., 397 Phillips Ave., Toledo, Ohio
Toledo Scale Co., 1029 Telegraph Rd., Toledo 12, Ohio
Tompkins' Label Service, Frankford Ave. at Allegheny Ave., Phila. 34, Pa.
Toronto Paper Mfg. Co., The, Toronto, Ohio
Tower Envelope Co., 1263 Virginia Ave., New York 60, N. Y.
Trade Lithograph & Printing Co., Inc., 684 Broadway, New York, N. Y.
Transcontinental Container Corp., 107-05 Northern Blvd., Corona, L. I., N. Y.
Trans-Pac Services, Inc., 66 S. 8th St., Newark, N. J.
Transparent Container Co., 82 Broadway, Kingston, N. Y.
Transparent Specialties Corp., 1120 Carnegie Ave., Cleveland 15, Ohio
Trautmann, Bailey & Blampey, 13 Laight St., New York 13, N. Y.
Traver Corp., 358 W. Ontario St., Chicago 10, Ill.
Trenton Folding Box Co., Ewing & Ogden Sts., Trenton, N. J.
Trenton Metals & Plastics Co., 10 Prince St., Trenton, N. J.
Triangle Ink & Color Co., Inc., 26 Front St., Bklyn, N. Y.
Triangle Package Machinery Co., 906 N. Spaulding Ave., Chicago, Ill.
Triangle Paper Bag Mfg. Co., 1301 Madison Ave., Covington, Ky.
Trilsch, Oscar Co., 150–25 18th Ave., Whitestone, N. Y.
Trio Metal Cap Co., 3021 West Carrol, Chicago, Ill.
Tri-State Packers Assn., Masonic Bldg., Easton, Md.
Tri-State Plastic Molding Co., Henderson, Ky.
Trum, E. J. Inc., 70–84 Richards St., Bklyn, N. Y.
Tungsten Contact Mfg. Co., Inc., Cottage Ave. & 73rd Rd., N. Bergen, N. J.
Tupper Plastics, Farnumsville, Mass.
Turner White Metal Co., Inc., New Brunswick, N. J.
Tuttle Press Co., The, 802 N. Union St., Appleton, Wis.
Twining Laboratories, The, 2527 Fresno St., Fresno 16, Calif.
Twitchell, E. W. Inc., Pkg. Div., 1042 Public Ledger Bldg., Phila. 6, Pa.
Two States Fruit Package Co., Texarkana, Tex.
Tygart Valley Glass Co., Washington, Pa.

U

Ullman Bag Co., 5205 Loraine Ave., Detroit 8, Mich.
Ullman, Martin, 113 W. 57th St., New York, N. Y.
Ullman, Sigmund Div., Sun Chemical Corp., Park Ave. & 146th St., Bronx 51, N. Y.
Uncas Mfg. Co., 623 Atwells Ave., Providence, R. I.
Unicrafts, Inc., 466 S. Pleasant St., Amherst, Mass.
Union Bag & Paper Corp., 233 Broadway, New York 7, N. Y.
Union Carbide & Carbon Corp., 30 E. 42nd St., New York, N. Y.
Union Insulating Co., Box 351, Parkersburg, W. Va.
Union Paper Box Mfg. Co., 1255 Westlake Ave., N. Seattle, Wash.
Union Paste Co., 1605 Hyde Park Ave., Hyde Park 36, Mass.
Union Specialty Co., 339 Watchung Ave., Plainfield, N. J.
Union Steel Products Co., 801 Pine St., Albion, Mich.
Union Wadding Co., 60 Dexter St., Pawtucket, R. I.
Unique Printed Products Co., Inc., 2222 N. 13th St., Terre Haute, Ind.
Unit Packages, Inc., 963 Newark Ave., Elizabeth, N. J.
United Comb & Novelty Co., Inc., 161 Sixth St., Leominster, Mass.
United Mfg. Co., 168 Birnie Ave., Springfield, Mass.
United Paper Box Corp., 727 N. Kedzie Ave., Chicago 12, Ill.
United Paperboard Co., 285 Madison Ave., New York 17, N. Y.
U. S. Adhesives Co., 1819 W. Carroll Ave., Chicago, Ill.
U. S. Automatic Box Machinery Co., Inc., 18 Arboretum Rd., Roslindale 31, Boston, Mass.
U. S. Bottlers Machinery Co., 4015 N. Rockwell St., Chicago, Ill.
U. S. Corrugated Fiber Box Co., 1409 Roosevelt Ave., Indianapolis 7, Ind.
U. S. Envelope Co., 21 Cypress St., Springfield, Mass.
U. S. Finishing & Mfg. Co., 775 W. Jackson Blvd., Chicago, Ill.
U. S. Lace Paper Works, Inc., 417 Union Ave., Bklyn, N. Y.
United States Plywood Corp., 55 W. 44th St., New York 18, N. Y.
United States Printing & Lithograph Co., The, 350 Beech St., Cincinnati 12, Ohio
United States Rubber Co., 1230 Ave. of the Americas, New York 20, N. Y.
U. S. Trade Mark Assn., 522 Fifth Ave., New York, N. Y.
Universal Button Fastening & Button Co., 2250 W. Fort, Detroit, Mich.
Universal Ceramics Corp., 38 E. 61st St., New York, N. Y.
Universal Folding Box Co., Inc., Monroe & 13th Sts., Hoboken, N. J.
Universal Jewelry Case Co., 165 Front St., Chicopee, Mass.
Universal Plastics Corp., 245 Jersey Ave., New Brunswick, N. J.
Universal-Engel Paper Box Mfg. Co., Inc., 6th & O'Fallon Sts., St. Louis, Mo.
Upressit Products Corp., 420 Lexington Ave., New York, N. Y.
Utica Box Co., Inc., 1608 Lincoln Ave., Utica, N. Y.

V

Vac-Spray Machine Co., 1701 Olson Highway, Minneapolis, Minn.
Valley Plastics, Inc., 105 Exchange St., Worcester, Mass.
Vanderlaan Tile Co., 103 Park Ave., New York, N. Y.
Van Doren, Nowland & Schladermundt, 220 E. 42nd St., New York, N. Y.
Van Dyke-Baird, 2100 W. Pierce St., Milwaukee, Wis.
Van Ness Bros., Inc., 104 Gray St., Paterson, N. J.
Van Norman Molding Co., 6437 S. State St., Chicago, Ill.
Varcum Chemical Corp., Packard Rd., Niagara Falls, N. Y.
Varey-Shea Bag Corp., 697 Spring St., Elizabeth, N. J.
Vassos, John, RCA Mfg. Co., Inc., Camden, N. J.
Veeder-Root Inc., Hartford, Conn.
Veneer Package Council, Washington, D. C.
Verhalen, Walter Co., P. O. Box 158, Hope, Ark.
Vertex Co., 40 W. 4th St., New York 12, N. Y.
Victor Mfg. & Gasket Co., 1059 S. Menard St., Chicago, Ill.
Victor Metal Products Corp., 196 Diamond St., Bklyn 22, N. Y.
Victoria Paper Mills Co., 1938 Reider, Fulton, N. Y.
Victory Button Co., Inc., 147 Seventh St., Leominster, Mass.
Victory Mfg. Co., 1722–24 W. Arcade Place, Chicago 12, Ill.
Virginia Barrel Co., Holland Ave., Staten Island, N. Y.
Virginia Carolina Chemical Co., Richmond, Va.
Visking Corp., The, 6733 W. 65th St., Chicago 38, Ill.
Vitapak Co., 115 W. Broadway, New York, N. Y.
Vlchek Tool Co., The, Plastic Div., 3001 E. 87th St., Cleveland, Ohio
Voges Mfg. Co., Inc., The, 99th St. near 103rd Ave., Ozone Park, N. Y.
Vol-U-Meter Co., The, 75 Wilbury Place, Buffalo 16, N. Y.
Von Miklos, Josephine, R.F.D. #1, New Canaan, Conn.
Voss, Karl Corp., 1100 Adams St., Hoboken, N. J.
Vulcan Stamping & Mfg. Co., Inc., 3000 Madison St., Bellwood, Ill.
Vulcanized Rubber Co., The, 261 Fifth Ave., New York, N. Y.

W

Waddill Printing & Lithographing Co., Danville, Va.
Walco Plastics, 456 Glenwood Ave., E. Orange, N. J.
Waldorf Paper Products Co., St. Paul 4, Minn.
Waldron, John Corp., New Brunswick, N. J.
Walker Bag Co., 120 N. 10th St., Louisville 2, Ky.
Wallace Paper Box Corp., 609 W. 51st St., New York 19, N. Y.
Walle & Co., 401 Tchoupitoulas St., New Orleans, La.
Walser Mfg. Co., Inc., The, Chester St., Clifton, N. J.
Ward, D. L. Paper Co., 401 N. Broad St., Phila. 8, Pa.
Ward Plastic & Rubber Co., 700 Woodward, Rochester, Mich.
Warneke Paper Box Co., 1617 Wazee St., Denver, Colo.
Warner Bros. Co., The, 325 Lafayette St., Bridgeport 2, Conn.
Warren, S. D. Co., 89 Broad St., Boston 1, Mass.
Warren Plastics Corp., S. Irvine St., Warren, Pa.
Washburn Co., The, 28 Union St., Worcester 8, Mass.
Washington Molding Co., Inc., 28 Davis Ave., Port Washington, N. Y.
Waterbury Companies, Inc., 835 S. Main St., Waterbury 90, Conn.
Waterproof Paper & Board Co., 427 E. Sixth St., Cincinnati 90, Ohio
Watertown Mfg. Co., The, 126 Echo Lake Rd., Watertown, Conn.
Watlow Electric Mfg. Co., 1320 N. 23rd St., St. Louis, Mo.
Watson-Standard Co., The, 225 Galveston Ave., Pittsburgh 30, Pa.
Waxed Paper Inst., 500 Brown Bldg., Rockford, Ill.
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